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A FLOCK OF SUFFOLK SHEEP AT STANTHORPE.

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Hybrid Maize Bulk-Handled And Artificially Dried

By N. J. DOUGLAS, Assistant Adviser in Agriculture.

The artificial drying of hybrid maize seed, combined with bulk handling on the farm, is something new to this State.

Messrs. D. E. and K. R. Poulsen, of E. L. Poulsen and Sons, "Beechwood," Cooroy, have devised a method of handling their hybrid maize seed which saves both time and labour. They have been able to do this by the construction of a maize drying plant and bulk holding bins, together with a system of elevators and chutes.

In 1937, the first hybrid maize yield trials were conducted on this property by Mr. W. W. Bryan, then Plant Breeder at Lawes.

It wasn't until the late 1940's, however, that the Poulsen brothers became one of the major commercial producers of hybrid maize seed in Queensland. This property now grows about 40 acres of crossing plots annually.

GOOD SEED.

Good seed is living matter. Diseased or damaged grain is useless grain. It represents a loss and its removal adds to the value of the final product.

In hybrid maize seed the hereditary characteristics of the hybrid have been fixed by the plant breeder. It is the responsibility of seed producers to turn out a sample of seed that fulfils the requirements of the Agricultural Standards Act.

Careful supervision at all stages is necessary to produce good seed with the minimum of handling and labour costs. The grower needs to prevent insect damage and disease, and combat the effects of climatic conditions.

Disease and weevil infestation start in the field, largely as a result of damaged or inadequate husk cover. These attacks are aggravated by high humidity or the presence of actual moisture.

WHY INSTALL A DRYING PLANT?

Seed maize, like any other grain, must be stored with the moisture content at or below 14 per cent. (preferably below this figure). With a moisture content above 14 per cent. moulds develop, causing a serious drop in germination.

When maize is mechanically picked, the moisture percentage will determine the amount of grain lost in the harvesting process. For instance, compare the loss of mechanically harvested maize recorded by Poulsen Bros:

In grain picked at 20 per cent. moisture, the field loss was approximately 1 per cent., but when picked at 14 per cent. moisture, the loss reached 10 per cent. or greater.

It takes a maize crop in the field 6 to 8 weeks to drop from 20 to 14 per cent. moisture. It follows therefore that if the maize can be picked at 20 per cent. moisture and artifically dried to 14 per cent. in a few days, field losses due to insects, disease, weather and mechanical harvesting are all reduced to a minimum.

To summarise, the value of a drying plant lies in:—

(1) Better harvesting conditions, for example less lodging.

(2) Smaller loss of grain in the field during mechanical harvesting.

(3) Less time for grain to deteriorate in the field from disease or weevil damage.

(4) Reduced hazards of cyclone and flood damage.

(5) Earlier land preparation for winter green manure crops.

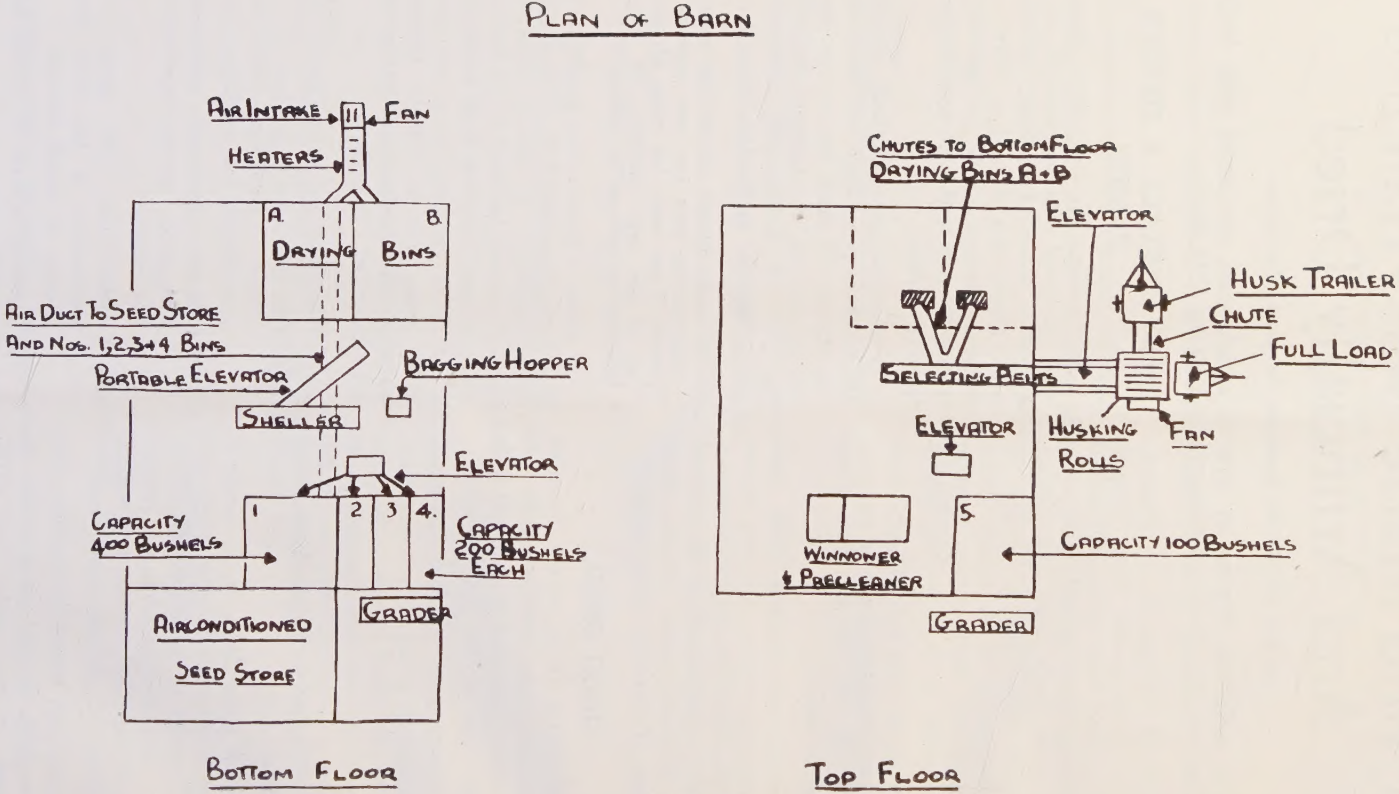


Plate 1.

Plan of the Maize Barn as Fitted for Drying and Shelling of Hybrid Maize Seed.

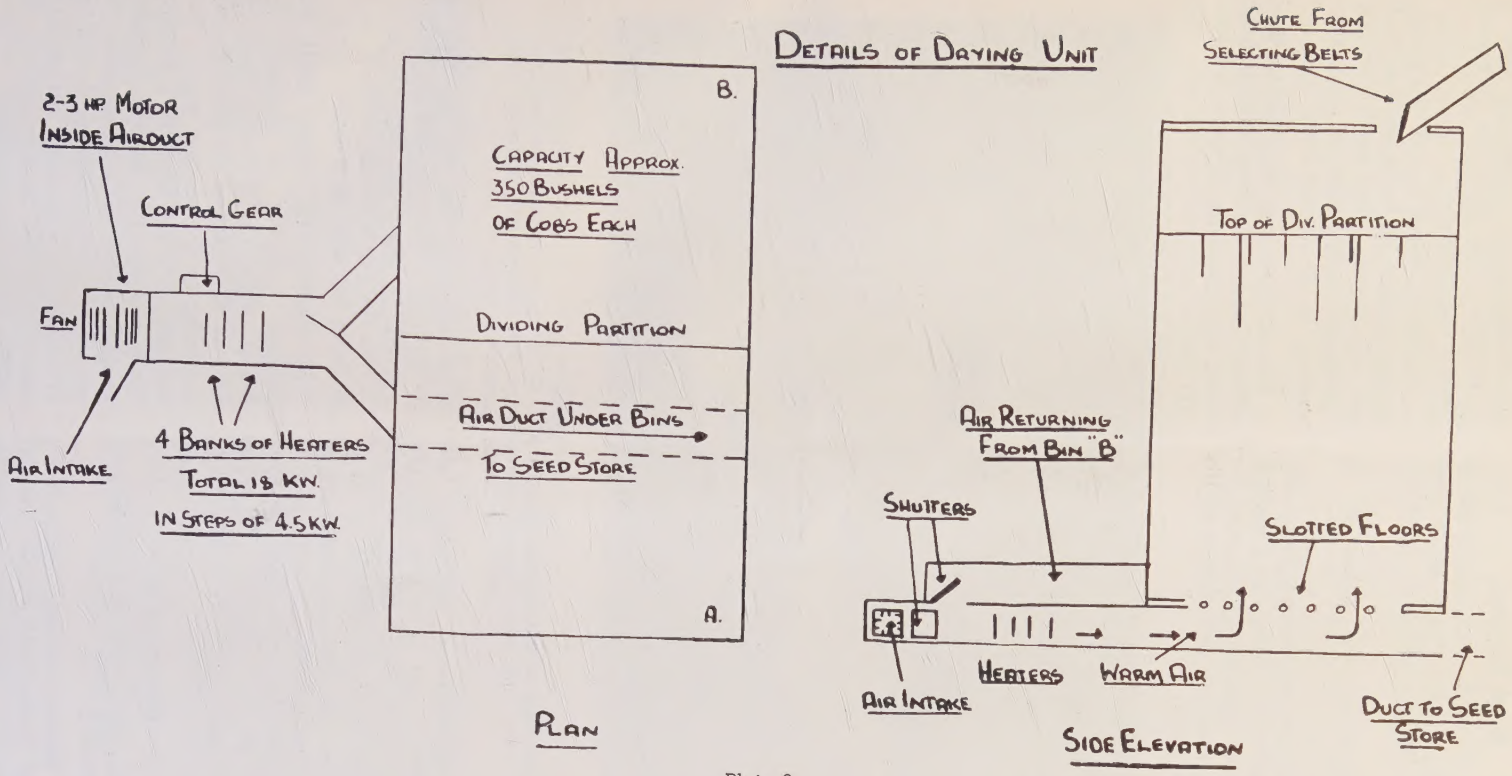


Plate 2.

Plan and Side Elevation of the Drying Bins. The main function of this unit is to dry the machine-harvested cobs prior to shelling and grading operations.

Shed Layout.

Plates 1 and 2 show the layout of the maize shed. This plant was designed for an existing two-storey building.

The following are points to be considered:—

(*a*) All bins are connected by easily controlled chutes to a central grain elevator. This elevator connects the two storeys of the building.

adjustable steps. There is also a thermostat built into the electrical control equipment.

The fan, powered by a 3 h.p. motor, has a capacity of 4,000 cubic feet of air per minute. The amount of air discharged varies with the resistance existing in the drying bins.

The air flow can be diverted into either of the two drying bins, each of which has a capacity of approximately 350 bushels of grain on the cob. All

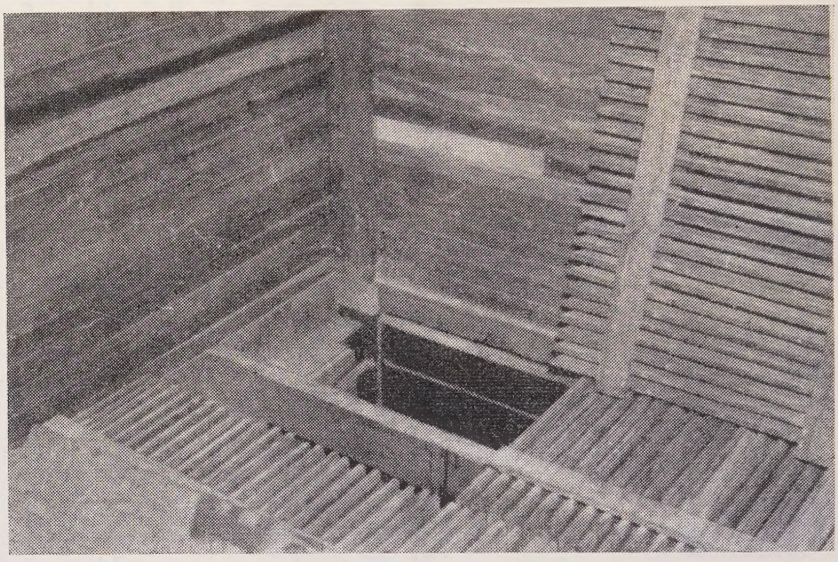


Plate 3.

Interior View of One Drying Bin. Air is forced up through the slatted floor, over a partition and down through the adjoining bin. These bins were specially designed for the handling of cobs.

(*b*) The winnower discharges into bins 1 and 2, or into separate portable bins which are not shown in the sketch.

(*c*) The grader, equipped with interchangeable screens, is connected by a side-shake conveyor to the grain elevator. The grain is gravity-fed from bin No. 5 to the grader.

Drying Unit.

The layout of this unit can be seen from Plate 2.

The heating element comprises 4 banks of heaters with a total power of 18 kilowatts. These are arranged in

grain treated in this unit has been on husked cobs. Under normal conditions, working 16 hours per day, the moisture in the grain can be reduced from 20 to 14 per cent. in 4 days.

In operating the drying plant, the internal humidity is obtained by testing with a hygrometer and the amount of heat and air-flow adjusted according to the reading taken. For example, on a dry day with a westerly wind blowing, the relative humidity reading would be approximately 40 per cent. At this reading, no heating of the air is necessary. In showery weather, all the heaters have to be used to reduce the humidity.

Handling Sequence.

The maize is picked by a mechanical maize picker which partially dehusks the cobs. The remaining husks are removed at the barn by the dehusking rollers. The husks are blown from under the rollers into a trailer for removal.

The cobs then go up an elevator to the selecting belt, where all damaged cobs are hand-picked and discarded. Then the undamaged cobs are chuted into the drying bins and dried. Here the grain receives a preliminary dusting with BHC for weevil control.

From the drying bins, the maize is elevated by a portable elevator to the sheller. After shelling, the grain passes up the grain elevator through the winnower into holding bins 1 and 2.

From these bins the grain passes up the grain elevator to bin No. 5. From this bin it is gravity fed into the grader, from which it emerges in several grades according to grain size and shape. The smaller grades are sampled and held under temporary label in 3-bushel bags. The bulk samples are diverted to the holding bins, where they are sampled and held under temporary label till certification is approved.

The sole reason for grading is to give farmers an even sample of seed. It makes no difference whether the samples are flats or rounds; they have the same hereditary factors and will produce the same yields.

Plate 4.

The De-husking Process. Cobs from the trailer go over the de-husking rollers and are then elevated to the top storey. The tractor drives a fan which blows the husks away from under the rollers.

After certification the grain is sent up the elevator to the bagging-off hopper; here it is bagged into one-bushel bags, labelled and sealed. The grain is dusted for weevil control in the various stages of production.

After bagging-off is completed, the grain is held in the seed store, which has a storage capacity of 1,500 bushels. This room is vermin-proof and is connected to the blower so that atmospheric humidity can be controlled.

OTHER USES FOR THE GRAIN DRYER.

The plant has proved economical for drying both baled and loose hay and also any grain either bagged or loose.

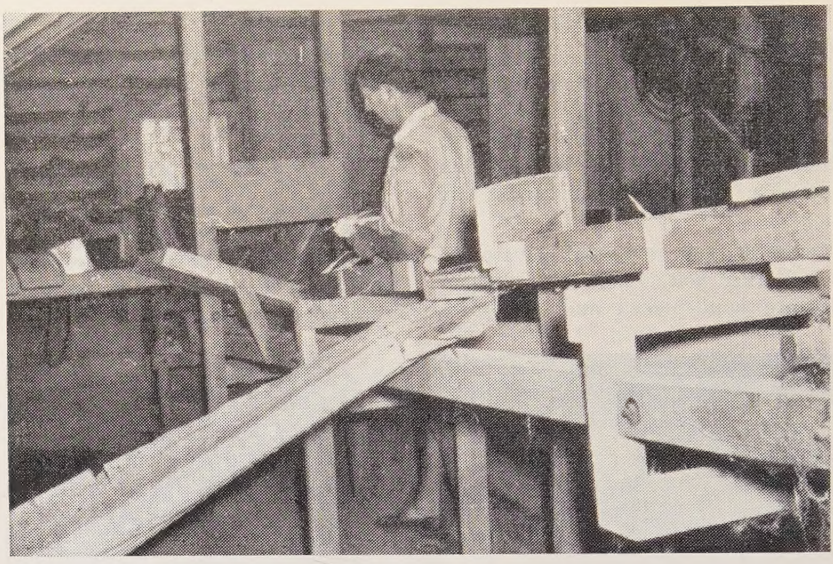


Plate 5.

The Selecting Belt. From the elevator, cobs pass on to the selecting belt. Damaged cobs are hand-picked and discarded, while the sound cobs go down a chute into the drying bins.

However, the dryer has been designed primarily for grain drying, and labour costs in hay drying are high. The capacity of these bins for hay drying would be 2 tons.

COSTS.

The electricity charges for the drying of maize are 6d. a bushel and for hay £1 a ton. It is important to remember that the plant was

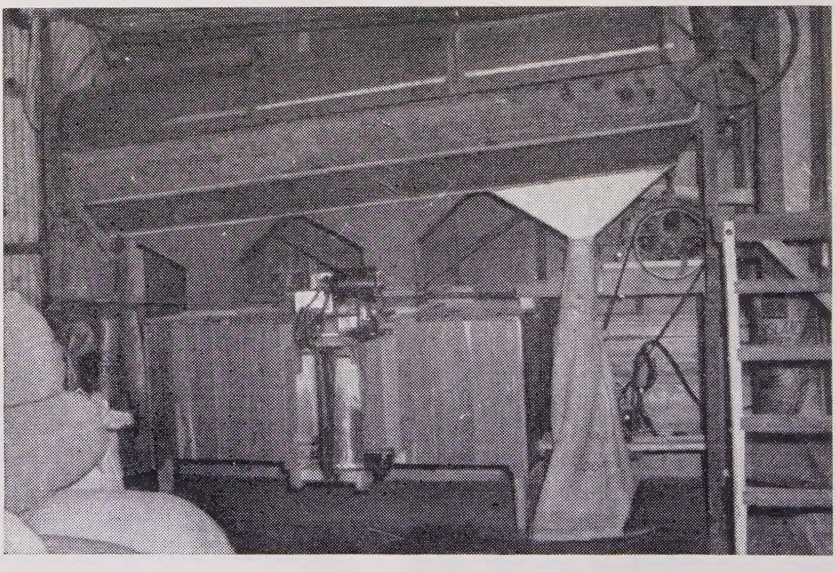


Plate 6.

Grading the Shelled Seed. This cylindrical grader is equipped with interchangeable screens which permit a separation based on size and shape of grain.

Plate 7.

Bagging-Off and Weighing. Here the grain is bagged, weighed, labelled and sealed. Behind the two sewn bags on the right is a movable grain bin.

especially designed for seed drying and that costs quoted do not take into account the capital value of the outfit.

The Poulsen brothers have satisfied themselves that the plant is not only economical for seed production, but is an absolute necessity in a fairly humid coastal climate. Such a drying plant also has excellent prospects for the treatment of bulk feed maize for farm storage. However, the economics of such a practice have not yet been determined.

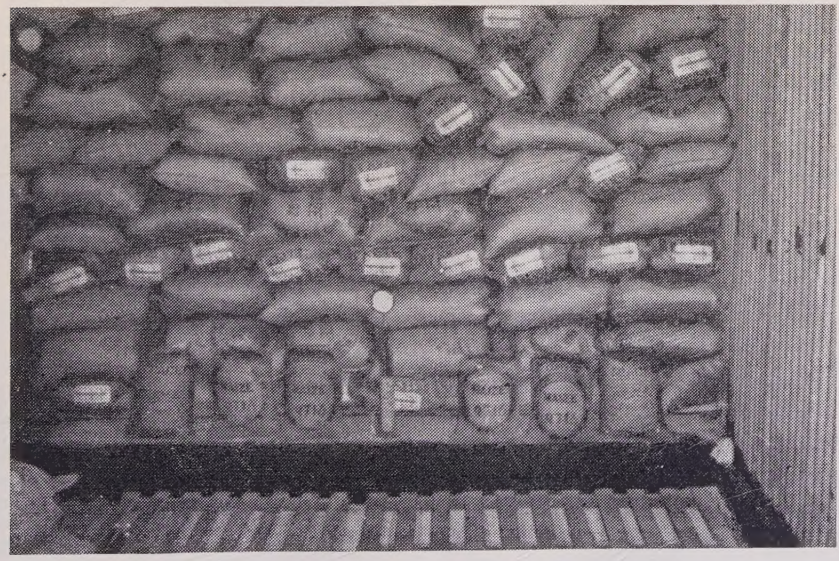


Plate 8.

Storage of Bagged Certified Seed. This store, which is air-conditioned by a duct from the drying unit, has a capacity of 1,500 bushels. The stem hygrometer in the middle of the picture is used for determining the moisture content of the bagged grain.

Plate 1.

Two Leafy Strains of Elephant Grass on Left. Biloela Regional Experiment Station.

Elephant Grass Shows Promise For Grazing

By B. GROF, Agrostologist.

Until recently little attention was paid in Queensland to the grazing value of elephant grass. Trials have shown, however, that the grass has valuable features such as high yields and nutritive values, rapid recovery after grazing coupled with dry weather resistance, and high palatability.

It is now recommended that this highly productive grass be used for supplementary grazing.

Elephant grass or Napier grass (*Pennisetum purpureum* Schum.) is a robust, cane-like (but non-saccharine) perennial species. Information with regard to establishment and management of elephant grass was published in the March, 1957, issue of the *Queensland Agricultural Journal*.

This is an account of the performance of elephant grass in trials conducted at the Biloela Regional Experiment Station.

The Station is located in the Callide Valley. The area receives an annual rainfall of approximately 28 inches. This rainfall is predominantly of summer incidence and over 70 per cent. of the total is received during the October-March period.

Although elephant grass was introduced to Australia over 40 years ago it has not reached any great economic value. Its distribution in Queensland is limited to isolated coastal districts which receive a higher rainfall.

In its native land, Africa, elephant grass occurs under a wide range of conditions. It forms reed jungles in

the delta of the Zambesi, thrives at 5,500 ft. in Rhodesia but it is also found in the savannahs of East Africa under comparable conditions to our sub-humid districts. It was reasonable, therefore, to expect that certain types of this valuable fodder grass would find conditions here highly congenial.

In tropical countries—including Queensland—elephant grass has been utilised primarily as cut forage and until recently little attention was paid in Queensland to its grazing value. Indeed the appearance of the grass is very deceptive. In ungrazed stands it becomes coarse and it gives the impression of being a rather unpalatable grass.

Two leafy introductions of elephant grass have been under observation at the Biloela Regional Experiment Station since 1950. From the results of this work and from the subsequent grazing trials it has become evident that elephant grass is a very promising introduction and the strain used in trials is well adapted to local conditions.

High yields and nutritive values, rapid recovery after grazing, coupled with dry weather resistance, and high palatability are the main features of the grass.

Early Spring Regrowth.

The spring regrowth is early and it occurs about the same time as in the main summer-growing grasses (Rhodes grass, green panic and buffel grass) used in the district. The peak growth of elephant grass coincides with the summer rainy period. The vegetative growth is usually slow from April onwards and the flowering culms appear during the autumn.

The foliage is highly susceptible to frost damage but no loss of stand has been observed due to frosting.

The trials have been limited to one soil type, the alluvial clay-loam which is typical of a large tract of country and supports intensive agriculture and dairying in the district. Soils of similar fertility are recommended for this productive grass.

Production in Grazing Trials.

The value of elephant grass as a grazing species is indicated by the yields obtained in a grazing trial. Apart from elephant grass the trial included a number of introduced grasses, a native grass and Rhodes grass as a standard for comparison. The whole area received the same grazing treatment. The grasses were established in 3 ft. 6 in. rows and inter-row cultivation was carried out periodically.

The average annual production of green and dry material from the grasses is shown in the table that follows:—

Species.	Average Yield in Tons/Acre per Annum (1954–57). (Av. of 3 Seasons).		Comparative Yield of Dry Matter When Rhodes Grass = 100.
	Green.	Dry.	
Elephant grass (Q. 2940)*	31·87	6·27	279·9
Guinea grass (Q. 2942)*	17·48	4·48	200·0
Setaria sphacelata (Q. 2968)* ..	17·59	3·75	167·4
Makarikari panicum	8·32	2·29	102·2
Rhodes grass commercial	8·33	2·24	100·0
Urochloa mosambicensis	5·82	1·45	64·7
Queensland Blue grass (*Dichanthium sericeum*)	2·16	0·93	41·5

* These species were introduced by the Plant Introduction Section of C.S.I.R.O. as C.P.I. 7838, 7647 and 8678 respectively.

—	Mean % of Crude Protein (1954–57).	Range.	
		Highest %.	Lowest %.
Elephant grass	10·25	14·3	5·2
Rhodes grass	8·97	11·9	4·8
Setaria sphacelata	7·87	12·8	4·5
Guinea grass	7·55	9·9	5·5
Urochloa mosambicensis	7·22	11·4	5·7
Makarikari panicum	6·45	8·1	3·6
Queensland Blue grass	5·30	7·6	4·1

Exceptionally high yields of 70.29 tons per acre green material (10.91 tons per acre dry material) were obtained from elephant grass from September, 1954, to March, 1955, when the total rainfall (33.63 in.) was some 5.5 in. above the average. This yield, however exceptional, indicates the productive capacity of the grass.

The average crude protein contents of the various species in the same trial are shown in the above table (The higher readings were obtained during the spring-early summer period and were representative of grass in the young leafy stage, whilst the low readings represent samples in the rank stage and they were analysed after the summer wet period).

Cutting Trials.

Trials with elephant grass under various cutting treatments have also been carried out. Green, and dry matter, yields and nutrient contents of forage cut at four, six and eight weekly intervals were recorded.

Under cutting treatment, dry matter yields and protein content in the dry matter followed the expected pattern, namely, the highest dry yields but lowest protein contents were obtained in elephant grass cut at eight-weekly intervals. The stand cut at four-weekly intervals gave the highest protein content but the lowest dry matter yield per acre.

The correlation between yield and nutrient contents is shown in the following table:—

Average Green and Dry Matter Yields in Tons per Acre, 1954–56.

Frequency of Cutting.	Yield (tons per acre)		% Dry Matter.
	Green.	Dry.	
Four weeks	24·87	3·71	14·9
Six weeks	28·53	6·32	22·1
Eight weeks	37·27	7·71	20·7

Average Crude Protein Content.

Frequency of Cutting.	Crude Protein Content in the Dry Matter.	Protein Production lb. per Acre per Annum.	Range.
	%		% %
Four weeks	11·0	806	8·1–15·1
Six weeks ..	8·2	1,030	6·8–10·3
Eight weeks	6·4	986	5·5– 8·0

Highly nutritious fodder can be obtained if the grass is cut or grazed at monthly intervals. While frequent grazing or cutting was required during the wet period, such frequent defoliation is not justified during the spring and after the summer rainy period to maintain the grass in a desirable stage for grazing.

It seems to be the best practice to adjust stocking rate and grazing frequency in such a way that elephant grass stands are grazed whenever the grass reaches a height of approximately 4 ft. A period of recovery should be allowed between grazings;

continuous close grazing will hinder the lateral spread of the grass. The first grazing or cutting could be delayed and this will assist the development of a strong crown.

Strip planting of elephant grass and lucerne under irrigation offers possibilities for grazing purposes provided the grass is kept short by controlled grazing. The water requirements of both components are relatively low and this mixture can be useful for summer grazing where the water supply is limited.

Conclusions.

In trials conducted at the Biloela Regional Experiment Station (Callide Valley) leafy types of elephant grass yielded heavy tonnages of green and dry material under grazing and cutting treatment. The strain used in trials has shown good adaptation to conditions experienced in this subcoastal district.

It is suggested that this highly productive grass be used for supplementary grazing, and the establishment of small areas in rows on cultivated land under judicious grazing management is recommended.

Plate 2.

Four Weeks' Growth on Elephant Grass in Pasture. Biloela Regional Experiment Station.

DAIRY HERDS CAN'T AFFORD "PASSENGERS."

Are there any "passengers" in your dairy herd—cows that aren't producing milk and cream to keep you, but cows you're working for instead? Unless you are herd recording it's hard to tell, but records leave no doubt.

Mr. S. E. Pegg, Chief Adviser in Herd Recording, Department of Agriculture and Stock, reports that more than 13,000 recorded cows in Queensland gave less than 100 lb. of butterfat last year. Average production of the 60,000 cows recorded was 149 lb. Cows producing at the 100 lb. level aren't paying their way—yet these represent 22½ per cent. of all recorded cows in Queensland.

Plate 1.

Expensive Equipment Is Not Essential. Showing the use of a screen and trough for harvesting Biloela buffel grass.

Pasture Seed Is A Cash Crop

By G. H. ALLEN, Senior Agronomist, Regional Experiment Stations Branch.

The ever-increasing demand for seed of pasture grasses and legumes offers scope for enterprising land-owners who desire either to start a new line of business or to supplement present farm income.

Continuing research at the Regional Experiment Stations and experiments conducted by the Department of Agriculture and Stock throughout Queensland have shown conclusively that vast improvement in the agricultural and pastoral industries is obtained by better pastures.

The use of grass and grass-legume mixtures in cropping rotations and for the development of improved pastures on grazing areas has the full support of agricultural scientists and progressive primary producers.

Over recent years the expansion of pastures has been limited by the meagre supply of seed and by the high price of the relatively small quantities available on the market. To help overcome these difficulties, seed production studies have been conducted at some Regional Experiment Stations for several years.

Pasture seed production is not a highly competitive business at present, and those who consider grass as a crop requiring special care, and manage it accordingly, may be confident that the returns will compare favourably with those obtained from many of the seed and produce lines now being cultivated in this State.

GRASSES IN DEMAND.

Species in demand include Rhodes grass, green panic, buffel grass, scrobic and perennial prairie. For irrigated pastures and for other special purposes seed of many grasses is sought, and some such as paspalum, guinea and molasses grass can be efficiently grown for seed production in Queensland. Probably phalaris and ryegrass seed also could be grown and harvested.

Plate 2.

A Small Tractor-mounted Belt-driven Stripper Used for Harvesting Seed of Tall Grasses.

Plate 3.

The Stripper Operating in Tall Guinea Grass.

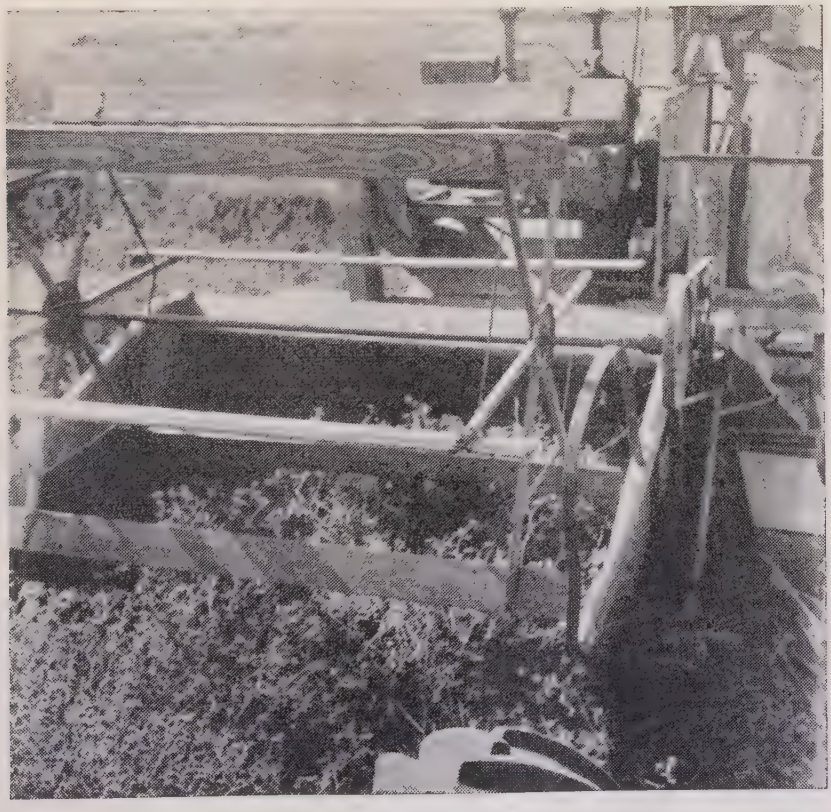


Plate 4.

Fully Mechanised Seed Harvesting of Stylo With an "All Crop" Harvester.

Most of the seed now produced comes from areas not specifically cultivated for seed production. But, as many practices can be mechanised and several special harvesters are available on the market, it is now possible to enlarge the areas and produce quality seed more cheaply than in the past, when hand labour was commonly employed.

Techniques for seed production of some of the grasses are reported periodically in the Queensland Agricultural Journal.

THESE LEGUMES ARE WANTED.

In addition to lucerne, cowpeas and clover seeds, which are normally available from merchants, there is a growing demand for other pasture legumes such as centro, stylo, glycine, pigeon pea and phasey bean which are now being utilized more fully in the tropical and semi-tropical regions of the State.

Techniques for production and harvesting of seed of these legumes have been developed at the Ayr Regional Experiment Station and results are reported on page 77 in this issue of the *Queensland Agricultural Journal*.

CASH RETURNS.

Production of greater quantities of grass and legume seed is essential if the current development of improved pastures and cropping systems is to be maintained.

As an indication of potential seed yields, minimum prescribed germination and approximate contract prices of some of the more important species, the following data obtained from Regional Experiment Stations, other sections of the Department, and seed merchants are tabulated:—

Grass or Legumes.	Potential Yield of Seed per Acre-lb.	Prescribed Minimum Germination.	Approximate Price for Contract Growers Nov., 1957 per lb.
		%	s. d. s. d.
Common Rhodes	100-200	20	2 0 to 6 0
Gayndah buffel	50–120	20	6 0 to 12 0
Biloela buffel	50–120	20	6 0 to 12 0
Cloncurry buffel	50–120	20	6 0 to 10 0
Western Australian buffel	50–120	20	3 6 to 10 0
Green panic	50–150	15	5 0 to 8 0
Guinea	80–100	15	7 0
Molasses	80–100	20	5 0
Perennial prairie	200–400	55–65	1 0 to 1 6
Phalaris	Not available	55–65	Not available
Ryegrass		60–65	
Paspalum	40–200	60	1 0 to 1 6
Pigeon pea (*Cajanus cajan*)	200–500	70	2 0 to 4 0
Centro (*Centrosema pubescens*)	300–600	50	3 0 to 4 0
Stylo (*Stylosanthes gracilis*)	70–150	40	10 0 to 12 6
Glycine (*Glycine javanica*)	85–200	50	10 0 to 12 6
Phasey bean (*Phaseolus lathyroides*)	30–100	70	10 0 to 12 6

COWPEAS FOR NEARLY EVERY FARM.

There's a place for cowpeas on nearly every Queensland farm, says Mr. O. L. Hassell, Senior Adviser in Agriculture, Department of Agriculture and Stock. As well as being a valuable green manure crop, cowpeas are useful to the stock-raiser for grazing, haymaking and silage.

The cowpea is a vigorous summer-growing annual of tropical origin. It does best under warm, moist conditions, but once established it has a marked capacity to survive dry spells. Cowpeas grow well in all coastal districts and good crops have been produced in drier inland districts like Emerald and Barcaldine.

Tropical Legume Seed Can Be Harvested Commercially

By G. VERHOEVEN, Experimentalist, Ayr Regional Experiment Station.

Results achieved in mechanically harvesting the seed of tropical legumes suggest that farmers can grow these legumes as cash crops and so provide a stimulus to the improvement of mixed pastures.

Seed shortage of our main tropical legumes has been an important limiting factor in the expansion programme for improved mixed pastures, and in the greater use of these species as green manure or cover crops.

Such tropical legumes as centro, glycine, and stylo grown either alone, or in combination with different pasture species, have shown great promise in grazing trials conducted in the northern and central coastal districts and some southern coastal areas of Queensland.

In view of the potential market for seed of these legumes, investigational work has been carried out at the Ayr Regional Experiment Station in the Burdekin district since 1953 with the primary aim of finding an efficient and economical means of harvesting that seed.

The unique combination of a wet and humid period from December to April, a dry winter and early spring with associated low humidity, and an ample supply of suitable irrigation water as experienced in this district has been found to be very favourable for the growing and seed harvesting of these legumes. Results to date have been encouraging and suggest that the mechanical harvesting of these legumes should be a commercial proposition for farmers in the Burdekin district.

While this article has been confined to a discussion of the main points in the growing and seed harvesting of only centro, glycine, and stylo, it is certain that other tropical legumes with similar growth characteristics can be harvested equally well.

HARVESTING OF CENTRO.

Centro (*Centrosema pubescens*) the most promising pasture legume of the northern coastal belt, is a perennial with an aggressive, vine-like type of growth, and a marked tendency to climb. It forms a dense and closely interwoven cover over the surface of the ground within five to eight months from the time of planting, which is generally early autumn or spring. The planting rate is 3–5 lb. per acre, drilled for preference in rows 3 to 4 feet apart to allow row cultivation during the early stages of growth. Seed treatment with commercial sulphuric acid for 15 minutes for seed which has been harvested longer than 6 months and thereby hardened, has resulted in a better and more even stand. The percentage of hard seed is generally as high as 60.

Flowering commences in April to May and extends over 6 to 8 weeks. Both centro and glycine set a better crop of seed if the vines are supported on trellises or are allowed to climb on secondary crops, such as pigeon pea (*Cajanus cajan*) or maize, which have an erect habit of growth. Where the presence of cheap labour makes hand-picking economically possible, this characteristic may be used to advantage. (Plate 1.)

[*The preceding article in this issue, "Pasture Seed is a Cash Crop," refers to the demand for these legume seeds and to the returns that may be expected.—Editor.*]

Five-foot Mower on Tractor.

However, for mechanical harvesting the normal method of growing has proved more satisfactory. The legume is harvested with a 5-foot agricultural mower mounted on the rear of a tractor, at a time shortly after the first pods commence to split.

An overlap of approximately 8 inches is used during mowing and in this way the rear wheels of the tractor hold the strip of centro which has previously been mown. Thus, while mowing the next strip, the mower is able to cut through the vines connecting the two strips. The mower is equipped with a protective cover under the drive shaft to prevent the vines from wrapping around it. (Plate 2.) Because of this the swath board is not required. With the cutting

Plate 1.

Centro on Post of Trellis. This form of growth is suitable for production of seed for hand-harvesting.

Plate 2.

Method of Attachment of 8-in. Belting Used to Prevent Vines Twining Around the P.T.O. Shaft.

width reduced to approximately 4 feet (on account of the over-lapping), the mower covers one acre in slightly less than two hours' mowing time.

The Case "All Crop" harvester has been used in all these harvesting trials. Under the dry weather conditions usually experienced in the Burdekin district during harvesting from late winter to early spring, the vines and pods dry out to a sufficient stage of brittleness for efficient threshing in 4 to 7 days after mowing. Seed pods which are fully developed but green at the time of mowing produce good viable seeds, as confirmed in laboratory germination tests.

With the Case header, the dry mown strips can be picked up evenly by lowering the cutter bar as close to the ground as possible. In this operation the reel beaters must be positioned close to the knives to assist in forcing the material up along the canvas conveyor belt. With this method it has not been found necessary to use the pick-up attachment available with the Case harvester. (Plate 3.)

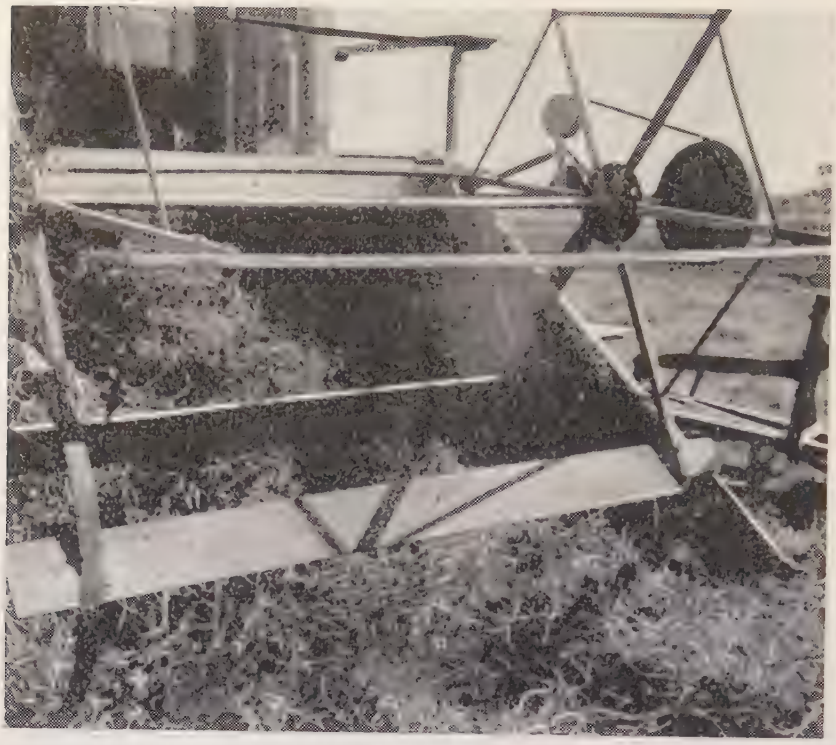


Plate 3.
Threshing Glycine Vines That Had Been Mowed Previously.

Plate 4.
Mowing a Good Seed-production Stand of Glycine.

For best results the spike-tooth threshing cylinder of the Case header is operated at speeds less than 800 r.p.m. to prevent undue cracking of the seed, in combination with a full set of concaves.

Experimental yields have varied from 300 to 600 lb. of seed per acre. These yields are quite satisfactory, keeping in mind that an area may be kept in production for several seasons.

GLYCINE BIG SEEDER.

Glycine (*Glycine javanica*) is a slender perennial quite similar to centro but less vigorous in growth. It has shown considerable promise as a pasture species on the Atherton Tableland as it is more resistant to frost than centro.

The same methods of establishment and seed harvesting as previously described for centro apply with glycine, except that a higher cylinder speed of approximately 1,030 r.p.m. is preferable for threshing purposes.

A seeding rate of 2–3 lb. per acre is used and a pre-planting treatment of seed older than 6 months with boiling water has given improved results.

The main flowering period occurs from June to July, while harvesting is carried out early in September. Glycine is a prolific seeder but is uneven in maturity and the pods shatter very readily when dry. Yields of up to 250 lb. of seed per acre have been obtained in our trials. (Plate 4.)

TRIALS WITH STYLO.

Stylo (*Stylosanthes gracilis*) is a vigorous perennial of South American origin. It grows to a height of 2–3 feet and is somewhat similar to lucerne in appearance. (Plate 5.)

Planting is carried out at the same time of the year as for centro and glycine, and a seeding rate about 2 lb.

Plate 5.

Stylo (S. gracilis) **Planted in 3 ft. 6 in. rows (29-11-54), Showing General Growth, Height, and Density of Stand.**

per acre is employed. Row spacing from 3 to 4 feet is also preferable with this legume to allow inter-row cultivation during the early stages.

The main flowering period extends from June to July. Like glycine this legume is a prolific seed setter and is uneven in maturity. Harvesting is carried out during August-September.

Normally this crop is mown and dried before machine harvesting, but trials have indicated that under the dry atmospheric conditions prevailing during the harvesting period in the Burdekin (August-September) it is possible for this crop to be harvested direct in the one operation with the Case header.

Under normal growing conditions of ample rainfall and supplementary irrigation, the dense seedheads are covered with a sticky secretion which prevents effective threshing. However, this condition may be overcome by discontinuing irrigation about the end of the flowering period, thus allowing the seedheads to dry out sufficiently for threshing.

By this method of moisture stress, the results obtained are similar to those when the crop is allowed to dry in the field after mowing.

A high cylinder speed is used in combination with a full set of concaves. The comb height of the header is set at approximately 8–10 inches below the top of the sward. Stylo flowers mainly on the outside of the plant and in even stands very little seed is lost by not cutting any lower. In the event of the stand being uneven, a second cut in the opposite direction could be made to ensure the harvesting of all available seed.

Stylo is more difficult to harvest than either centro or glycine. While the level of seed production appears to be somewhat constant, experimental yields have varied from 70 to 200 lb. of seed per acre. It appears that this legume is very sensitive to weather changes and moisture lack during critical periods of growth.

AMERICAN LESSON FOR OUR FARMERS.

There's a lesson for Queensland farmers in the way American primary producers have learnt to live with their climate.

The Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) said this point is made by Mr. W. J. S. Sloan, Director of Agriculture, who has recently returned from a six-month study tour of the United States.

He said Mr. Sloan's report makes it clear that the United States farmer puts every effort into living with his climate.

The report states: "Where water is short, the American farmer stores it and uses irrigation. He conserves large quantities of hay, silage and grain for feeding out to stock during dry weather.

"This is a lesson for Queenslanders. We must learn to farm efficiently with the soils and climate we have. Parts of the United States are just as well acquainted with drought as we are. I believe that the combined efforts of farmers, graziers, research workers and advisory officers can do much to improve our capacity to meet the challenge of drought."

2,4,5-TP Stops Fruit Drop In Apple Trees

By T. J. BOWEN, formerly Horticulturist, Horticulture Branch.

Experiments conducted in the Stanthorpe district over the past two years have shown that a hormone known as 2,4,5–TP (2,4,5–trichlorophenoxypropionic acid) will effectively control pre-harvest drop in apples for about four weeks.

Prior to World War II., research in America demonstrated the value of some hormone sprays for reducing pre-harvest drop in apples and, within a few years, ANA (alphanaphthaleneacetic acid) was being used commercially in that country. Not long after this, the application of ANA to varieties such as Gravenstein and Jonathan became standard practice in the apple-growing areas of Stanthorpe.

Although treatment proved useful in the Granite Belt, the results obtained in commercial practice were rather variable. Its main disadvantages were a relatively short period of effectiveness and the difficulty of timing the spray application accurately.

Since the inception of ANA as a pre-harvest drop spray, the search for new and better materials has continued. The search has now placed a more efficient spray—2,4,5–TP—within our reach. The new chemical (which is already in commercial use in America) gave excellent results in Queensland trials. These were so outstanding that 2,4,5–TP is almost certain to replace ANA as a pre-harvest drop spray for apples here.

ANA for Drop Control.

Some varieties of apple, such as Gravenstein and Jonathan, are prone to excessive pre-harvest drop and sprays such as ANA have been used for some years to reduce losses. Occasionally, the results are far from satisfactory. Such failures are due partly to the limitations of the material and partly to faulty timing of the spray application.

If conditions just prior to the harvesting period are warm and dry, premature fruit drop usually occurs. The losses differ from variety to variety. They are particularly acute in early-maturing varieties grown in the Granite Belt if windy weather occurs during the Christmas period.

An ANA spray will effectively control pre-harvest drop for approximately 14 days but, at the end of this period, a heavy drop may occur unless a second spray is promptly applied. At least two sprays are required in a normal season for effective control of pre-harvest drop. Under hot, dry conditions, successive treatments may be necessary at 10-day intervals to obtain satisfactory results over the harvesting period.

ANA is applied at a concentration of 10 parts per million in the form of a drenching spray. It is essential that the whole tree be covered, for the hormone is taken in through the leaves and the fruit stalks. Treatment normally begins about five days before the commencement of harvesting.

Greater Latitude with 2,4,5–TP.

The hormone 2,4,5–TP has given excellent results in experimental work at Stanthorpe over the past three years. When applied at concentrations of 20 to 50 parts per million, a single spray effectively controlled pre-harvest drop in the Gravenstein apple over the total harvesting period of 26 days. It has a longer period of effectiveness than ANA and this allows the grower a greater latitude in the timing of the spray.

The spray should be applied earlier than was customary with ANA as it acts rather more slowly. Treatment about a week before the commencement of harvesting should prove satisfactory in orchard practice.

Nevertheless, in trials conducted on the property of Mr. D. Goodwin, Thulimbah, one 2,4,5–TP spray applied five days before the commencement of natural abscission was superior to two sprays of ANA for the control of fruit drop in the Gravenstein apple. Comparable results were obtained in the Jonathan apple.

Fruit Ripening Accelerated.

As the commercial use of 2,4,5–TP is a new development in Queensland, further work is necessary to determine its effects, if any, on fruit maturity and skin colour in the several commercial varieties.

This hormone is reputed to hasten the development of fruit maturity and this could be a disadvantage in varieties such as Delicious if the fruit is to be cold-stored after harvesting. On the other hand, 2,4,5–TP is said to enhance the red skin colour of the fruit and this could be a distinct advantage in dessert varieties of apple.

Accelerated ripening of the fruit is unlikely to be a problem in the two main varieties, Gravenstein and Jonathan, which are most subject to pre-harvest drop at Stanthorpe. As a matter of fact, no differences in fruit colour or time of fruit maturity were noticeable between the several treatments in the experimental trials with these varieties.

Fruit drop is only occasionally serious in the Delicious apple. It appears that ripening in this variety is influenced by the time of application of the spray; the closer the spray is applied to the normal harvesting period, the less is its effect on time of fruit maturity. It is also probable that fruit harvested from sprayed trees before it is over-mature will store as well as that from unsprayed trees. If this is so, selective picking to set standards of maturity should prove satisfactory on 2,4,5–TP-treated trees when the fruit is to be cold-stored.

In the Gravenstein apple, as much as 60 per cent. of the crop may fall prematurely if pre-harvest drop sprays are either not applied or applied ineffectively. The replacement of ANA by 2,4,5–TP in the pre-harvest drop control programme gives the orchardist greater latitude in timing his treatment so that there is less risk of the sprays being used inefficiently. This should provide a boost to the industry.

For efficiency and economy, the 2,4,5–TP spray (50 p.p.m.) should be applied as a matter of routine to the varieties Jonathan and Gravenstein a few days prior to the anticipated fruit drop.

HIGHER PASPALUM YIELDS WITH NITROGEN.

Nitrogenous fertilizer will lift the yield and protein content of summer-growing paspalum pastures in the coastal districts of south-eastern Queensland.

Mr. A. Hegarty, Agrostologist in the Department of Agriculture and Stock, said this had been demonstrated in trials at Upper Coomera during the last 12 months. He pointed out that productivity of many paspalum pastures in this part of south-eastern Queensland has declined in recent years due to a lack of nitrogen. Invasion of mat grass has also become a problem in high rainfall areas.

Paspalum pastures, treated in December, 1956, with 2 cwt. and 4 cwt. of sulphate of ammonia to the acre, produced 40 and 70 per cent. more grass respectively than untreated plots. Protein content also was increased from 9 per cent. in untreated plots to 12 per cent. in plots receiving the 4 cwt. dressing.

White Grubs And Their Control In Dairy Pastures

By G. W. SAUNDERS, Assistant Entomologist.

Success in dealing with white grub damage to Queensland dairy pastures has come through—

Either ploughing and planting to other pasture species after suitable rains in early summer;

Or by renovating with a chisel implement during the wet season in late summer.

Soil-inhabiting white grubs occur in most pastures in coastal and sub-coastal Queensland, but have caused concern only in the Mount Tamborine area in South Queensland, and in the vicinity of Yungaburra and Malanda on the Atherton Tableland, North Queensland. These lands, originally dense rain forest, were cleared some 50 years ago. Within a few years paspalum (*Paspalum dilatatum* Poir.) became the dominant pasture species, and on many farms has been grazed more or less continuously ever since.

White grubs are larvae of melolonthid beetles which fly in large numbers during the evenings after suitable rain in early summer. Mating takes place at dusk and the beetles may be seen on stumps, logs, fences, small shrubs, and other low obstacles.

Plate 1.

A Mount Tamborine Pasture with White Grub Damaged Patches on Far Hillside.

Plate 2.

White Grubs (R. magnicornis) Exposed by Rolling Back Damaged Paspalum.

The eggs are deposited in the soil to a depth of a few inches, and within three weeks hatch into small white grubs.

These first-stage larvae complete their growth in two months, then moult and enter the second stage, which occupies about 10 months.

After a second moult early in the second year, third-stage grubs, about 2 inches in length, appear.

As soil temperatures fall in June and July the full-grown larvae burrow deeper into the soil, sometimes to a depth of 2 feet, and there pupate in earthen cells. During spring the pupae change to beetles, which emerge after sufficient early summer rain has moistened the soil to the required depth.

Only the third-stage grubs are destructive root feeders, and damage to pastures therefore may occur from February to June. Often the obstacles on which mating has taken place are foci of infestations, whilst in other instances large patches may be destroyed. Where infestations are severe the dying grass can be rolled back to reveal as many as 10 grubs per square foot. Eventually the damaged areas may become infested by weeds, and in some instances by shrubs.

In Queensland, white grubs damage only long-standing pastures.

CONTROL.

Some modern insecticides which have helped solve other white grub problems have been tested thoroughly

Plate 3.

Part of Improved Pastures at Mount Tamborine (ploughed and planted to molasses, kikuyu and phalaris grasses and clovers).

Plate 4.

Rhopaea magnicornis (3 times natural size).

Plate 5.

Lepidiota caudata (3 times natural size).

during the past few years for the control of these pests in Queensland dairy pastures, and for this purpose have proved of no practical value. Furthermore, experience has shown that grub damage is an indication that the pastures require attention other than by direct attempts to kill the pests.

Outstanding economic successes have been achieved by either ploughing and planting to other pasture species after suitable rains in early summer, or by renovating with a chisel implement during the wet season in late summer. When pest species of white grubs are still present the soil should be well disturbed.

To obtain full benefit from improved and renovated pastures, and to lessen the chances of further white grub infestations, sound pasture management is required.

Detailed advice on this subject may be obtained from the local officer of the Agriculture Branch of the Department.

SCIENTIFIC NAMES.

White Grubs.

In the Mount Tamborine area	*Rhopaea magnicornis* Blkb.
On the Atherton Tableland	*Lepidiota caudata* Blkb.

SOWN PASTURES TREBLE STOCKING RATE.

Rain-grown sown pastures have trebled the stocking rate in the 25-inch rainfall Chinchilla district, Dr. W. A. T. Summerville, Assistant Under Secretary (Technical) in the Agriculture Department said recently.

Dr. Summerville, who is also chairman of the Queensland Dairy Pasture Improvement Advisory Committee, said that this was one of the highlights of the committee's report on its year's work.

Pastures of green panic and lucerne, and Rhodes grass and lucerne at Baking Board, near Chinchilla, showed great promise in a year of below-average rainfall. They carried a beast to three acres compared with a beast to nine acres on native pastures in the same district.

The committee's annual report describes 100 pasture trials carried out during the last season. The trials were laid down in every dairying district in Queensland from the Atherton Tableland to the New South Wales border. They were supervised by district officers of the Agriculture Department.

The merits of top-dressing dairy pastures with superphosphate to promote clover growth were again examined in coastal districts of south-eastern Queensland. It was found that treatment with 4 cwt. of super. and 10 cwt. of lime to the acre increased clover yields up to six times. This work clearly shows that, given sufficient soil moisture, establishment of clovers in these pastures is very largely a question of applying the correct type and amount of fertilizer.

Dr. Summerville said the report also tells of exploratory trials in south-eastern Queensland with the so-called tropical grasses and legumes. Even in the sub-tropical clime, these pasture species, especially the legumes centro, style and Townsville lucerne, are showing great promise on suitable soils.

Studies that could lead to more efficient methods of conserving excess feed during flush periods for use in dry times are being carried out in conjunction with the Department's Division of Animal Industry at the Animal Research Institute, Yeerongpilly. This is of great importance to the dairy industry.

One section of this work involves grazing management studies. Here, rotational grazing with the conservation of excess pasture as silage is compared with continuous grazing. The second project is a study of the effect of different methods of manufacture on the use and value of grass silage.

Plate I.
Milk Testing in a Laboratory.

The "Blue Test" Aids In Clean Milk Production

By J. CALEY, Dairy Research Branch.

The methylene blue test is used in all Queensland milk factories to measure the bacterial activity of incoming milk. It thus acts as a yardstick for suppliers as to the quality of the milk and conditions of production.

The best possible way to encourage people to drink more milk is to provide a supply of clean and safe milk in which the public can have perfect confidence.

Clean milk is free from visible dirt and excessive bacteria. It should be produced in surroundings that would be acceptable to consumers if they were able to visit the farms. This is a standard that field men can use in appraising dairy buildings and equipment.

Milk leaving the udder contains few bacteria. These grow in large numbers inside milking machines not carefully cleaned and sterilized, and are washed off by the milk. In this way bacteria in milk are an index of the cleanliness of production.

Why Test Milk?

Tests which depend on the bacteria in milk provide the most sensitive way of measuring the cleanliness of production. Such tests supplement the

visits to farms of Dairy Officers, and are used in conjunction with the examination of milk at the factory for appearance, taste, and smell. It is necessary for such tests to be simple, cheap, quick, reliable, and independent of human judgment. These conditions are met by the methylene blue test.

How the Blue Test Works.

The blue test depends on a function of bacteria which is somewhat similar to breathing in higher animals. Bacteria remove oxygen from the liquid in which they are growing, and so oxygen becomes scarcer. The greater the bacterial activity the more quickly the oxygen is used up.

An indicator is needed to show when the oxygen level has dropped to a certain point, and one substance which does this is methylene blue. This dye changes colour from blue to colourless when the demand for oxygen reaches a certain level. The time taken for the milk to change colour from blue to white is a measure of the level of bacterial activity. This is the principle of the methylene blue test.

Performing the Test.

The sample of milk tested must be representative of the consignment. This sample is taken by means of a sterile dipper from the weigh vat at the factory, and is poured into a sterile test-tube. Samples are tested immediately or are kept cold if testing has to be delayed for a short period.

Standard methylene blue solution is added to the test-tubes, which are then placed in a vessel of warm water, and are examined every half hour. A record is kept of the time taken for each sample to lose colour. Results are given in hours, and the greater number of hours, the better the result.

Using the Results.

Milk that has a blue test of four hours or more is satisfactory for market milk, while milk which tests five-and-a-half hours is better still. Thus this test helps in identifying clean milk.

No substantial improvement in the quality of the milk supply is to be expected unless an economic stimulus is afforded to the producer for the extra trouble and expense involved in producing clean milk. Where an economic stimulus is provided, and this is fairly general, the improvement is spectacular. The methylene blue test is a fair and equitable basis on which to provide such an economic stimulus, and so ensure clean milk.

BULL PROVING EXTENDED TO A.I.S. BREED.

Queensland's dairy bull proving scheme will be extended to the A.I.S. breed in 1958. Dairy bull proving has been carried on in Queensland since 1955, when a start was made to identify outstanding sires in the Jersey breed.

The aim of bull proving is to find herd-improving sires that can then be used for large-scale improvement of the State's dairy cattle. With artificial insemination an outstanding bull can be used to sire hundreds of calves a year instead of the 40 or so possible under natural mating.

The job of identifying a herd-improving bull is difficult, but modern methods of animal breeding have greatly reduced the element of chance. A.I. has been probably the greatest aid.

In bull proving, each of a number of suitable sires from Queensland studs is used to artificially inseminate 300 or so cows on about 50 farms practising herd recording. Heifers from these inseminations are reared on the farms and production-recorded during their first lactation.

The breeding value of the bulls is assessed from the average production of their daughters.

Putting Milk To The Test

By W. F. SCHUBERT, Dairy Research Branch.

Many farmers are receiving reports of the chemical analysis of milk supplies and perhaps wondering as to the importance and significance of such testing.

The following may help to show what happens when milk is tested chemically, and how the results can guide the producer.

The Dairy Produce Acts define the standard of milk as follows: Milk shall be the clean, fresh secretion obtained by completely emptying the udder of the healthy cow, properly fed and cared for, and shall be exclusive of the milk obtained during fifteen days immediately prior to and ten days directly following on parturition. It shall contain not less than eight and five-tenths parts per centum of milk solids-not-fat, not less than three and three-tenths parts per centum of milk fat, and not less than twelve parts per centum of milk solids. It shall not contain any added water, separated milk, preservative, or other foreign substance, and shall not have had any milk fat removed from it by skimming, separation or any other process. Its freezing point shall be not higher than 0.55 degrees centigrade below that of pure water. The specific gravity of the total solids shall not be higher than 1.35.

The standard is set to protect the consumer from buying milk that has been adulterated by skimming or watering, or milk that is naturally poor in chemical quality. The testing is also a valuable guide to the producer as to the overall chemical quality of the milk supply produced by his herd.

WHAT IS IT MADE OF?

To appreciate the tests that are performed in order to ensure that milk conforms to the standards laid down by law, it is necessary to know something of its chemical composition.

Milk is one of the most complex foods that appear on the meal table. Physically it consists of an oil-water emulsion. Chemically its components may be classified into five well-marked groups:—(1) Water, (2) fat, (3) proteins, (4) sugar, and (5) ash. The constituents other than water are known as total solids (T.S.) and the total solids minus fat as solids-not-fat (S.N.F.).

Total solids are the basis of such concentrated forms of milk as condensed milk and dried whole milk.

Solids-not-fat are the principal constituents of dried skim milk.

Water is the constituent that gives bulk to milk. In general the amount of water may range from 82 to 90 per cent. In a mixed herd the variation is usually much less—between 84 and 88 per cent.

The fat in milk is spoken of as milk fat, butterfat, or simply fat. It is present in minute droplets or globules which vary in diameter depending on the breed, stage of lactation, and the individual cow.

The fat is not in solution but is present as an emulsion. The spherical shape of the globules is accounted for by the force of surface tension. Due to this force, the milk fat globule assumes the smallest surface area possible in relation to its volume. This form must be spherical.

Chemically fat is not a single compound but is a mixture of several compounds known as glycerides. Some of these glycerides are common to all

fats while others are peculiar to milk fat. Herein lies the basis for distinguishing butterfat from margarine.

Three per cent. to Eight per cent. Fat.

The fat in milk may range from 3 to 8 per cent., depending mainly on the breed inheritance of the animal. Other factors such as the age and physical condition of the cow, stage of lactation, season of the year, and milking intervals also affect to a greater or less degree the fat content of milk. Milk to be examined chemically, should be drawn preferably from a 24-hour sample.

The main proteins of milk are casein and albumin. The coagulum produced when rennet or dilute acids are added to milk is chiefly casein. The casein is not in true solution but exists in the milk in a state of extremely fine colloidal suspension as a complex of calcium caseinate and calcium phosphate.

The albumin in milk may be obtained as a flaky precipitate by heating slightly acidified whey or milk serum after the fat and casein have been removed. In constitution and behaviour it closely resembles white of egg.

Milk sugar or lactose belongs to a group of substances known as carbohydrates. It is a white substance less sweet in taste than cane sugar.

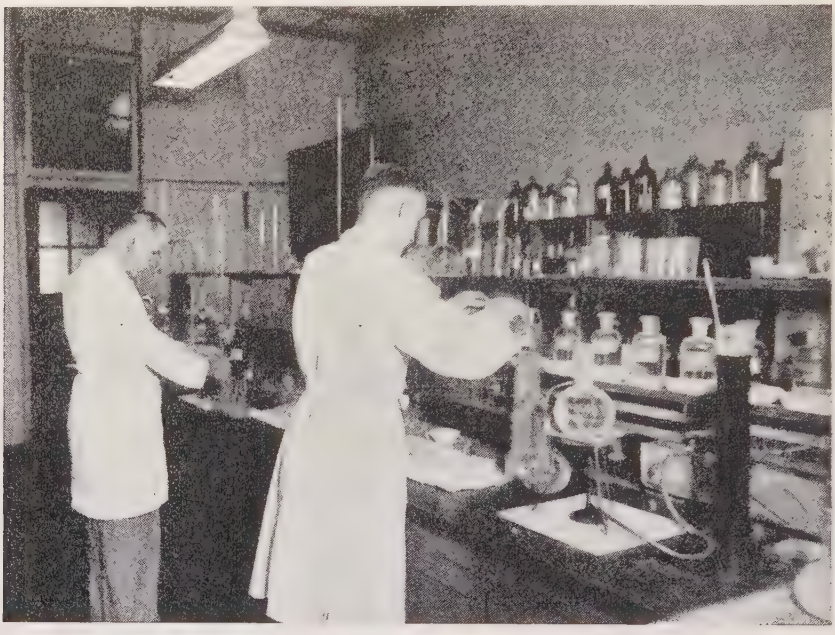


Plate 1.

Daily Milk Samples Being Tested in the Chemical Section of the Dairy Research Laboratory, Brisbane.

Lactose is converted into lactic acid by the action of bacteria. This conversion results in what we call "souring". Lactose is in true solution in the water of milk and may vary in amount from less than 3 to more than 6 per cent. of the milk. The usual amount is about 5 per cent.

The ash or mineral part of milk may vary from 0.56 to 0.94 per cent., but is generally around 0.68 to 0.74 per cent. The ash consists largely of the chlorides and phosphates of sodium, potassium, magnesium and calcium with minute amounts of iron,

copper, zinc, aluminium, manganese, and iodine as well as other trace elements possibly traceable to the soil on which the feed is grown.

In practice milk is not normally tested for all of its constituents. Testing on the receival platform is limited to butterfat and total solids. If the composition of the milk is suspect these tests are supplemented by tests for adulteration.

DETERMINATION OF FAT.

Fat is tested for by the Babcock test. This test is based upon the fact that strong sulphuric acid will dissolve the serum solids in milk and set the fat free from its emulsion. To make the test the milk is placed in a specially constructed test bottle and mixed with the proper quantity of sulphuric acid.

The acid performs a number of functions:—

(1) It dissolves the serum solids, and frees the fat so that it can be quickly brought to the surface by centrifugal force;

(2) It develops heat which keeps the fat globules mobile;

(3) It increases the specific gravity of the serum.

After the solution of the serum solids has been effected, the complete separation of fat and acid serum is accomplished by whirling the test bottle in a centrifuge. The fat is then forced into the graduated neck of the test bottle by adding hot water gradually, followed by further whirling—so that the percentage of fat may be read directly.

DETERMINATION OF TOTAL SOLIDS.

The easiest way to determine the amount of total solids in a sample of milk is to separate them from the water and weigh them. This is the method commonly used in the laboratory. A small quantity of milk is weighed into a shallow flat-bottomed dish and heated until all the water is driven off. During this evaporation the milk must not be heated to more than a degree or so above the boiling point of water, because at any higher temperature some of the solids are decomposed.

The Lactometer.

The total solids may be obtained by calculation from a formula, provided the fat content and specific gravity of the milk are known. The fat is obtained by means of the Babcock test and the specific gravity is obtained by means of the lactometer.

The specific gravity of a substance is the ratio of its weight to the weight of an equal volume of another substance taken as a standard. Water is the standard for solids and liquids. The average specific gravity for normal whole milk is 1.032. This means that if a certain amount of water weighs 1,000 lb., the same quantity of milk would weigh 1,032 lb. ($1{,}000 \times 1.032$).

The specific gravity of a liquid may be determined by means of a hydrometer. The hydrometer works on the principle "that if a body floats in a liquid it is buoyed up by a force equal to the weight of the liquid it displaces." Thus a body would not sink as far in a heavy liquid as it would in a light one, because it would take a smaller volume of the heavy liquid to equal the weight of the body. A special form of hydrometer is used for taking the specific gravity of milk. It is called a lactometer.

When measuring the specific gravity of milk by means of a lactometer, the reading must be made at a standard temperature which is 60 deg. F. The reason for this is that heat affects the density of a substance. A rise in temperature of a liquid will cause it to become thinner and therefore to have less weight per unit volume.

Whole milk varies in specific gravity from 1.029 for poor milk to 1.034 for rich milk. The average specific gravity

of separated milk is 1.036 while that of cream varies from 0.93 to 1.0. Pure butterfat has a specific gravity of 0.9 at a temperature of 140 deg. F.

Once the specific gravity and the butterfat have been measured the total solids (T.S.) content of the milk can be found from the following formula:—

$$T.S. = \frac{1}{4} L.R. + {}^{6}/_{5}F + 0.14$$

where

T.S. = Total solids
L.R. = Lactometer reading
F = Percentage of fat

ADULTERATION WITH WATER.

The determination of the freezing point of a sample of milk is a sensitive method of detecting the presence of added water. Unadulterated milk has a freezing point which is quite constant and is generally given as —0.55 deg. C. or 31.01 deg. F. The freezing point depends on the soluble constituents, mainly lactose and salts. These compounds have a close inverse relation; that is, when one rises in amount the other lowers and vice versa. This accounts in a large measure for this constancy. The freezing points of whole milk, cream and separated milk agree very closely with the average value of —0.55 deg. C. This illustrates the fact that the freezing point depends, not on the composition of the sample, but on the concentration of the dissolved solids, mainly lactose and salts. The fat existing in the milk as coarse globules and the casein as colloids have no effect on the freezing point.

The detection of adulteration depends on the change in the freezing point of milk when water is added. When water is added the freezing point of milk is raised towards the freezing point of water (O deg. C.). The percentage of added water in milk can be calculated according to the following formula:—

$$\text{Added water (per cent. w/w)} = \frac{-0{\cdot}55 - \text{freezing point of sample} \times (100 - T.S.)}{-0{\cdot}55}$$

By the methods described, it is possible to determine the most important constituents of milk for manufacturing or liquid milk purposes and their relative value.

The tests outlined also permit an accurate appraisal and determination of any chemical abnormality in the milk supply and so perform an important aid and guide to farmers as to the quality of the milk supply.

FARMERS PROFIT BY HERD RECORDING.

The past 10 years of production recording have laid a solid foundation for dairy herd improvement in Queensland. Since a modern recording scheme was initiated at Beaudesert in January, 1948, interest in recording has mounted year by year. Recording has spread to every dairying district in the State, and last year nearly 60,000 cows in more than 1,400 herds were tested. In the first year, 17,000 cows in 537 herds were recorded.

Herd recording has clinched the case for seasonal calving in Queensland. It has shown that, in every year, herds calving in certain months give the greatest average production. As a result of this proof, seasonal calving is now widely practised.

Carefully used in a breeding programme, production records can play a leading part in building up the standard of a herd. Today, hundreds of farmers are relying on these records to help them in their farm management.

Big increases in yields have followed the application of herd recording information. A recent survey showed that the herds which had been recorded continuously for seven years and more produced an average of 182 lb. of butterfat last year. In herds recorded for one year only, the average yield was 140 lb.

Dairy Calf Feeding And Rearing Practices Surveyed

By C. H. CLARK, Dairy Adviser, Division of Dairying.

There is need for improvement in calf rearing methods being used on many Queensland dairy farms, where, on the average, a complete herd replacement is necessary every six years.

Systems are required that make the best use of feeds available, while facilities for calf rearing need to be raised to a higher standard.

It was shown in a previous article ("A Survey of Dairy Herd Wastage in Queensland"—Q.A.J. November, 1957) that the average annual wastage of cows in Queensland dairy herds was 16.8 per cent. This means that the average milking herd is completely replaced every six years. The rearing or purchase of replacements thus becomes an important aspect of dairy farming, as calves will always constitute about one-sixth of the herd.

The purchase of heifers for herd replacements is not advised. Their production potential is nearly always unknown, and it is difficult to assess their status of health. Farmers who rear their own heifer calves, however, have these factors under their control.

The aim when rearing calves should be to develop healthy animals which will be capable of producing good yields of milk and butterfat for at least six lactations after joining the milking herd.

STUDY OF HERD RECORDING GROUPS.

This survey indicates the manner in which calves were reared by farmers who were in herd recording groups during 1955-56 and 1956-57.

The information was collected by herd recorders from 460 farmers in each month of the two years mentioned. They secured figures on all farms concerning the calves which were born between monthly visits. Data on the rearing practices of calves from one month old to weaning were supplied by 255 farmers. These were collected chiefly during the summer months of 1955 and 1956.

Treatment of Young Calves.

The survey revealed that newly born calves were left with their mothers for periods varying from a few hours to 28 days. The average time was five days, after which they were either tethered or placed in a pen. Of the farmers, 39.8 per cent. preferred to tether their calves, while 60 per cent. placed then in a pen immediately after removal from their mothers. It was noted that 22.4 per cent. of the farmers who tethered their calves for a period later allowed then to run in a pen.

It was surprising to note that so many of the farmers tied up calves for several weeks. When calves are tethered it is usually difficult to provide protection from sun, wind, or rain. During wet weather tethered calves must be moved frequently if the small area available to them is not to become fouled, and predispose them to infections.

Feeding Bails.

Of the farmers who placed their calves in pens 37.3 per cent. provided feeding bails. It was not ascertained how many sets of bails were portable. The use of feeding bails ensures that each calf gets its share of feed, and the transmission of infectious diseases is reduced.

After calves were taken from their mothers, the feeding of wholemilk was continued for an average period of 17

days. In areas where milk was supplied to factories and skim-milk was unavailable, calves in some cases were fed on wholemilk for periods up to 90 days. Grain or meal was fed to young calves by 31.1 per cent. of the farmers included in the survey. Supplements are normally fed by suppliers of milk, but a further examination showed that of the farmers who fed supplements 21.8 per cent. were supplying cream to butter factories and therefore had skim-milk available.

It appears that grain forms the bulk of most concentrate meals fed to calves. A skim-milk-grain ration would be well balanced provided that sufficient skim-milk was fed. It was noted that molasses was also fed in some areas as portion of the concentrate ration.

The addition of minerals, vitamins or antibiotics to the concentrate mixture or milk was practised by 3 per cent. of farmers. Young calves on a normal diet receive an ample supply of minerals. Of the vitamins necessary for good health, vitamin A is the only one likely to be deficient as calves have very little reserve of it at birth.

One Month Old to Time Of Weaning.

When the calves were a few weeks old, 71 per cent. of the farmers included in this survey placed them in a paddock. Approximately 51 per cent. of these farmers kept them in the same paddock until they were weaned. More than one paddock was used by one-fourth of the farmers while the remaining one-fourth had a system of rotational grazing for the calves. Many of the farmers who used more than one paddock allowed calves to have access to crops. (From two weeks of age it is recommended that calves should be rotated systematically in suitably sized paddocks which should be well grassed and regularly top-dressed as necessary.)

In addition to pasture, crops, and skim milk, other feeds were used. Altogether 46.7 per cent. of farmers fed concentrates to calves during this period and 8.2 per cent. also used molasses, vitamins, or antibiotics. Hay was fed by 25.1 per cent. of farmers. Unfortunately, information was not available concerning the period for which supplements were fed, so it is not known whether such feeding was for short periods only or was an integral part of the feeding programme.

Licks or mineral supplements were provided for these calves by 23.9 per cent. of farmers.

The age at which calves were weaned ranged from 2 to 15 months. The weaning age depended largely on whether milk or cream was being supplied to factories by farmers. A total of 35.9 per cent. of the farmers weaned their calves when 6 months old, while 18.6 per cent. weaned them at 5 months or younger. The average time of weaning was 7 months.

REASONS FOR DEATHS OF CALVES.

The causes of deaths of calves from one month old to the age of weaning were tabulated from diagnoses made by farmers. Table 1 shows that calf scours was easily the most important cause of deaths. In the "Other Causes" section deaths from three-day sickness, bloat, redwater, and attacks by dingoes and so on have been included.

TABLE 1.

Reason.	Percentages of all Deaths.
Scours	13·2
Pneumonia	8·2
Poisoning	7·2
Accident or Injury	5·6
Worms	5·3
Blackleg	5·3
Leptospirosis	4·7
Other Causes	22·3
Unknown Causes	28·2

DISEASE CONTROL.

The chief disease control measure adopted by the farmers was to inoculate calves with strain 19 vaccine for the prevention of brucellosis. These inoculations were given to calves on 62.4 per cent. of the farms. Blackleg vaccinations were given to calves on 45.1 per cent of the farms, while 38 per cent. of farmers used chemicals for worm control.

This survey was carried out in 1955-56 and 1956-57 only and information concerning the regularity of innoculations was not collected. Therefore, it is not known whether farmers practise disease control each year, or at intervals such as every two or three years.

DEHORNING.

There are three methods of dehorning calves and heifers—chemical, hot iron, and mechanical. The farmers were asked to denote if calves or heifers were dehorned, and to give the method used. Altogether 64.7 per cent. of farmers stated that their calves were being dehorned; 36.4 per cent. of them were using the chemical method; 1.2 per cent. the debudding or hot iron method, and 62.4 per cent. the mechanical method. Most farmers who used the mechanical method dehorned heifers with the conventional dehorners.

ROOM FOR IMPROVEMENT.

Having selected calves from high-producing cows, it should be the farmer's aim to raise them so that they may develop into cows with the capacity for high production.

This survey, which was conducted in herds which were being recorded for production, shows that a variety of feeding and rearing practices is being adopted.

It is clear from the survey that there is appreciable room for improvement in calf rearing methods on Queensland dairy farms, and particularly in the formulation by the farmer of a system that makes the best use of feeds available. Improvement in the facilities provided for calf rearing seems to be necessary on many farms.

A DIRTY SYRINGE CAN BE A KILLER.

A dirty syringe can kill your stock, warns Mr. W. R. Ramsay, Veterinary Officer in the Department of Agriculture and Stock at Kingaroy. On the other hand, a clean syringe can help to save your animals' lives. Look after your farm syringe and keep it clean.

Veterinarians and farmers often use syringes to give injections to stock, most commonly to cattle, sheep and pigs. Outbreaks of foot rot, tick fever, milk fever, oat tetany and many other diseases need treatment by injection. A dirty syringe can cause an abscess at the site of injection. Blood poisoning may set in and the animal may die. If it lives, it won't be profitable for some time. Quite often the treatment is blamed for the trouble, but in fact, the real culprit is poor hygiene in carrying out the treatment.

So, pull your syringe to pieces. Clean it and the needles with a tooth-brush and disinfectant. Remove all the dirt and wash in clean water; then boil for 10 minutes. Dry the pieces, put the syringe together again and pack it away in clean cotton wool. Leave it somewhere handy ready for use. In this way you may be assured that it will not cause trouble.

When treatment is to be carried out, follow this procedure: Before handling the syringe, clean your hands with soap and water, or disinfectant. Clean the skin at the site of the injection with cotton wool and methylated spirit. After treatment, clean your syringe again as soon as you can. Carelessness gives poor results in treatments. Don't use a dirty syringe on your animals—you wouldn't like a doctor to use a dirty syringe on you!

Tuberculosis-Free Cattle Herds. (As at 1st January, 1958).

Aberdeen Angus.

G. H. & H. J. Crothers, "Moorenbah," Dirranbandi
A. G. Elliott, "Ooraine," Dirranbandi
W. H. C. Mayne, "Gibraltar," Texas

A.I.S.

M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
F. B. Sullivan, "Fermanagh," Pittsworth
D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
W. Henschell, "Yarranvale," Yarranlea
Con. O'Sullivan, "Navillus" Stud, Greenmount
H. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest
J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy.
Sullivan Bros., "Valera" Stud, Pittsworth
Reushle Bros., "Reubydale" Stud, Ravensbourne
H. F. Marquardt, "Chelmer" Stud, Wondai
A. C. and C. R. Marquardt, "Cedar Valley," Wondai
A. H. Sokoll, "Sunny Crest" Stud, Wondai
W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
W. H. Thompson, "Alfa Vale," Nanango
S. R. Moore, Sunnyside, West Wooroolin
H.M. State Farm, Numinbah
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
D. G. Neale, "Grovely," Greenmount
A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
W. D. Davis, "Wamba" Stud, Chinchilla
Queensland Agricultural High School and College, Lawes
C. K. Roche, Freestone, Warwick
Mrs. K. Henry, Greenmount
D. B. Green, "Deloraine" Stud, Durong, Proston
E. Evans, Wootha, Maleny
T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
J. Crookey, "Arolla" A.I.S. Stud, Fairview, Allora
M. F. Power, "Barfield," Kapaldo
A. H. Webster, "Millievale," Derrymore
W. H. Sanderson, "Sunlit Farm," Mulgildie
R. A. and N. K. Shelton, "Vuegon" A.I.S. Stud, Hivesville, *via* Murgon
R. R. Radel & Sons, "Happy Valley," Coalstoun Lakes
C. A. Heading, "Wilga Plains," Maleny
G. S. and E. Mears, "Morden," M.S. 755, Toogoolawah

Ayrshire.

L. Holmes, "Benbecula," Yarranlea
J. N. Scott, "Auchen Eden," Camp Mountain
E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
T. F. Dunn, Alanbank, Gleneagle

Friesian.

C. H. Naumann, "Yarrabine" Stud, Yarraman
D. J. Pender, "Camelot," Lytton road, Lindum
S. E. G. Macdonald, "Freshfields," Marburg

Guernsey.

C. D. Holmes, "Springview," Yarraman
A. B. Fletcher, Cossart Vale, Boonah
W. H. Doss, Degilbo, *via* Biggenden
A. C. Swendson, Coolabunia, Box 26, Kingaroy
C. Scott, "Coralgrae," Din Din Road, Nanango
R. J. Wissemann, "Robnea," Headington Hill, Clifton
G. L. Johnson, "Old Cannindah," Monto
A. Ruge & Sons, Woowoonga, *via* Biggenden
G. Miller, Armagh Guernsey Stud, Armagh, M.S. 428, Grantham

Jersey.

Queensland Agricultural High School and College, Lawes
J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
J. F. Lau, "Rosallen" Jersey Stud, Goombungee
G. Harley, Hopewell, M.S. 189, Kingaroy
Toowoomba Mental Hospital, Willowburn
Farm Home for Boys, Westbrook
P. J. L. Bygrave, "The Craigan Farm," Aspley
R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
E. A. Matthews, "Yarradale," Yarraman
A. L. Semgreen, "Tecoma," Coolabunia
L. E. Meier, "Ardath" Stud, Boonah
A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
F. W. Verrall, "Coleburn," Walloon
C. Beckingham, Trouts road, Everton Park
W. E. O. Meir and Son, "Kingsford" Stud, Alberton, *via* Yatala
G. H. Ralph, "Ryecombe," Ravensbourne
Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah
Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
J. W. Carpenter, Flagstone Creek, Helidon
H. G. Johnson, "Windsor" Jersey Stud, Beaudesert
W. S. Kirby, Tinana, Maryborough
S. A. Cramb, Bridge st., Wilsonton, *via* Toowoomba
G. & V. Beattie, "Beauvern," Antigua, Maryborough
J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
W. C. M. Birt, "Pine Hill" Jersey Stud, Gundiah
T. Nock, Dallarnil
P. Fowler & Sons, "Northlea," Coalstoun Lakes
F. Porter, Conondale
H.M. State Farm, Palen Creek
B. T. Seymour, "Upwell" Jersey Stud, Mulgeldie

Poll Hereford.

W. Maller, "Boreview," Pickanjinnie
J. H. Anderson, "Inverary," Yandilla
D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick.
E. W. G. McCamley, Eulogie Park, Dululu
Wilson and McDouall, Calliope Station, Calliope

Poll Shorthorn.

W. Leonard & Sons, Welltown, Goondiwindi

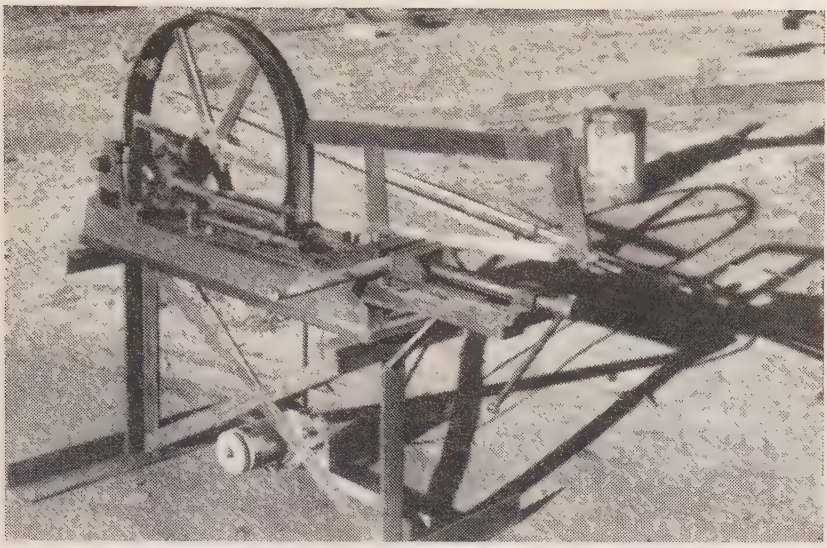


Plate 1.
Power Hack-saw Ready for Operation.

A Power Hack-saw

By L. T. FOSSEY, Dairy Officer.

There is always a certain amount of maintenance work to be done on the dairy farm and it can take up a lot of time. Here is a saw that is mechanically driven and is capable of cutting wood, piping, and iron. It is at present in use in the garage of Mr. R. Shannen at Marlborough and has proved to be a great time-saver. (Plate 1.)

The materials required for the saw are:—

(1) An old horizontal vacuum pump.

(2) 4 ft. 7 in. of 2 in. x ¼ in. flat iron.

(3) One 17-in. hack-saw blade.

(4) One machine vice.

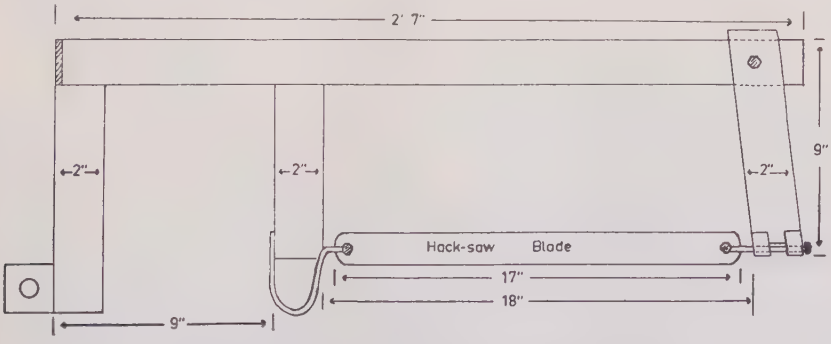


Plate 2.
Cross Section of Power Hack-saw Attachment Unit.

CONSTRUCTION.

Dismantle the vacuum pump, leaving the base plate and bearings, crankshaft and driving wheel, and the driving rod intact. To the end of the base plate from which the vacuum pump was removed attach a machine vice.

The holding frame and the attachment for the cutting hack-saw blade are shown diagrammatically in Plate 2.

The holding frame is attached to the driving rod at the point where the piston rod was removed. This attachment is made loose by the insertion of a pin so as to allow the holding frame to be swung up into the non-cutting position.

When constructing this unit it should be remembered that all horizontal vacuum pumps may not have the same dimensions. The length of the holding frame will have to be adapted to fit the particular type of pump. To ascertain the length of the holding frame, place the crankshaft on its most backward position and measure from the connecting point of the saw holding frame to the jaws of the machine vice.

WHAT SIZE ARE YOUR EXCAVATED TANKS?

The wide use of modern earth-moving equipment in the past 10 years in Queensland sheep areas has introduced a very important factor into tank excavation. Sheepmen are putting down *larger* tanks.

This is not just a manifestation of modern methods of doing things "better and bigger." It is a very fundamental factor in water conservation in tropical areas, where a depth of seven feet of what appears to be good, solid water can vanish annually simply through summer evaporation. In many areas the drought which has caused anxiety and huge stock losses in Queensland has been essentially a "water drought." Scores of small tanks have gone dry.

Field officers in the Sheep and Wool Branch have for years been concerned about the small capacity of many earth tanks in sheep areas. Read what Mr. R. B. Young, Senior Adviser in Sheep and Wool, has to say:

"All sheepowners can't put down 100,000 cubic yard tanks; but you must get away from the idea that 5,000 and 10,000 cubic yard tanks are going to see you through even a moderate drought. I would not feel happy with a tank of less than 20,000 cubic yards, in pretty well any Queensland sheep area."

Here is a concrete case of a South-east Queensland grazier's present water problems quoted by a field officer:

"Over the past 10 years £9,000 has been spent on 13 water sites for a total of 55,000 cubic yards, and by now, there would not be a drink in the 13 tanks. All the water left is in two holes in the creek and two miles of bore drain. Rainfall on the property from August, 1956, to August, 1957, was 7½ inches. October, 1957, gave 105 points and December 50 points. Total, 905 points since 1st August, 1956."

Even with 20,000 cubic yard tanks and upwards, summer evaporation and wet season silt deposits decrease your water conservation in large doses. The job is a big one, and modern methods of tank sinking are wasted unless you plan your tanks to be big enough to see droughts through.

Remember that as a primary producer you are allowed to claim capital expenditure as an income tax deduction on: "Expenditure on the construction of dams, earth tanks, underground tanks, irrigation channels or similar structural improvements . . . . . for the purpose of conserving or conveying water for use in carrying on primary production on the land."

Plate 1.

Sheep Affected by Body Louse. The wool cheque will suffer.

Some Methods Of Treating Sheep For Body Lice

By R. B. YOUNG, Senior Adviser, Sheep and Wool.

It has been estimated that there are between 13 and 14 million sheep in the areas of Queensland infested with the body louse (*Damalinia ovis*). The 1957 sheep figures showed that there were more than 23 million sheep grazing in this State. So it is apparent that about two-thirds of Queensland sheep are in areas where, unless proper control methods are practised, it is possible for them to become infested with sheep lice.

Greater residual properties of modern insecticides, the use of power spray dips, and more recently, portable spray dips for off-shears treatment of sheep, have added further methods of approach to the problem of louse control.

Some of the advantages and disadvantages of the various types of plant and improvements used for dipping sheep are tabulated for purposes of comparison.

PLUNGE DIPS.

Advantages.—No costs for fuels and oils. Return fluid and allow some re-use.

Total immersion of sheep.

No mechanical parts to cause hold-up.

Eradication probably highest because of total immersion.

Disadvantages.—Fairly costly to install. Need to empty each night increases cost of insecticides. Labour for extra mustering.

Slow rate of dipping; sheep become resentful.

Require much more labour to operate.

Permanent site. Cannot be used out on run.

More risk of bacterial infection, particularly off shears.

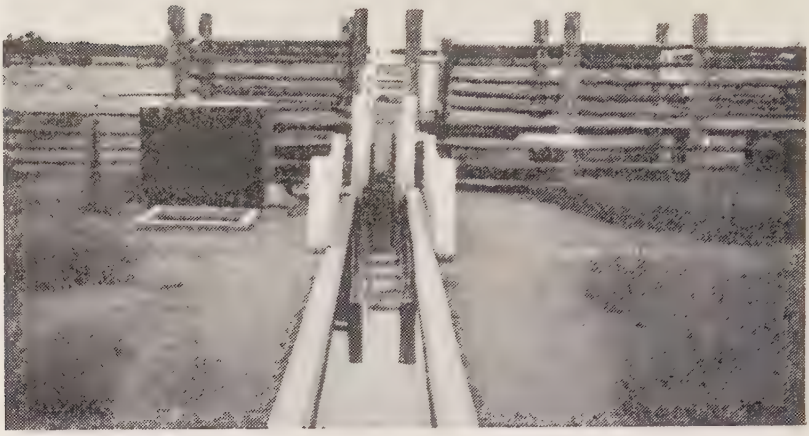


Plate 2.

An Excellent Plunge Dip at Harden Park, Blackall. The grated forcing pens at the approach to the dip prevent carrying in of dirt which can foul dip fluid.

Plate 3.

Dipping in Progress in Plunge Dip. Persuasion is needed to make sheep "take the plunge".

Plate 4.

Plunge Dipping Makes Big Demands on Labour.

Careless dipping can poison sheep. Careless baling can poison pastures.

Sheep injured through jumping, bones broken, skin torn, bruising. Possible wool stain from dirty dip.

POWER SPRAY DIPS.

Advantages.—Save costs by returning fluid and allowing re-use.

Immersion is satisfactory if sufficient time is allotted.

Plate 5.

Dipping Sheep in A Power Spray. Many can be handled at once. Mechanical faults sometimes cause hold-ups.

Rapid working; do many sheep quickly.

Need few men to operate.

Infection risk less than with plunge dips.

Minimum damage to sheep.

Eradication probably efficient.

Disadvantages.—Fairly costly to install. Running costs, fuel and oil higher than with plunge dips.

Permanent site; cannot be used out on run.

Subject to possible mechanical fault; engine, pump, or nozzle stoppages. Possibility of corrosion of pipes and nozzles if not flushed after use.

PORTABLE SPRAY DIPS.

Advantages.—The most inexpensive form of plant. Cost much lower than power spray or plunge dips. Use off shears obviates second muster.

Outstanding for numbers of sheep put through. Perhaps the most effective feature. Can deal with 1,500 an hour comfortably. Practical observers agree that there is no difficulty in getting sheep to run.

Little labour required to operate.

Light weight, easily portable, handled, erected. Can bring dip to sheep, instead of sheep to dip. Can be used in paddocks for emergency dipping.

No stagnation of fluid. Infection risk very small as little or no re-use of insecticides.

If race outlet constructed to avoid bruising, there should be little or no damage to sheep. No wool stain from dirty dip.

Preliminary trials indicate that they are efficient if properly and carefully used.

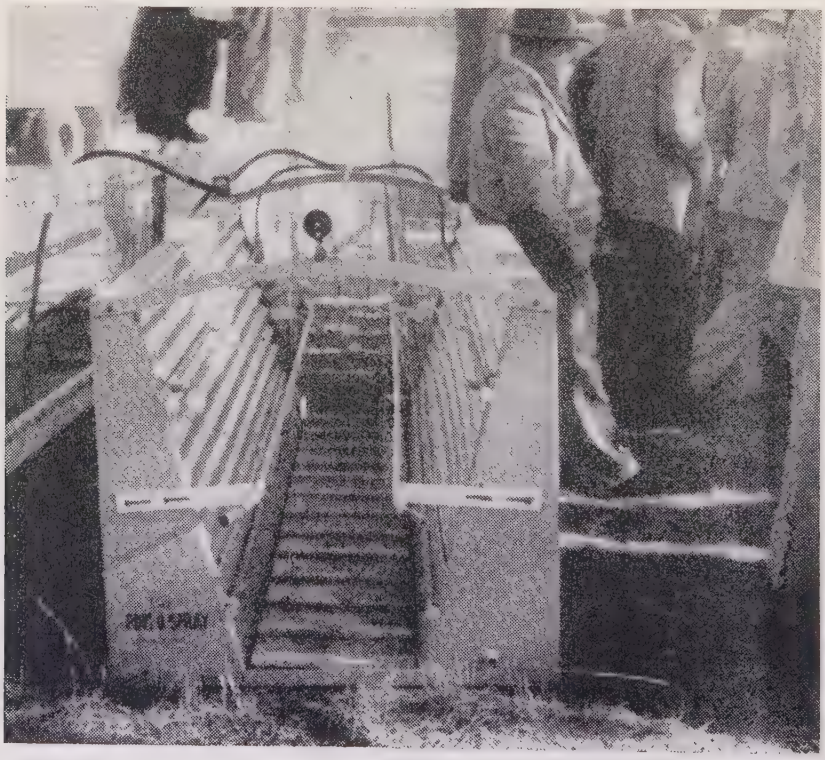


Plate 6.

Sheepmen Listening To A Field Day Lecture. They are standing near one of the modern portable spray dips.

Plate 7.

Another Type of Portable Spray Dip in Action under Field Conditions. The dip can be brought to the sheep instead of the sheep having to be brought to the dip.

Disadvantages.—Very brief exposure to insecticides. Not so complete or radical a wetting as with plunge or spray dips. (However, ability of modern insecticides to diffuse through the wool to the skin may obviate this fault.)

Subject to possible mechanical fault, engine, pump, nozzle stoppages. Possibility of corrosion of pipes and nozzles if not flushed after use.

Slushy conditions underfoot if many sheep put through.

Unless properly and carefully used the degree of efficiency could easily be inadequate.

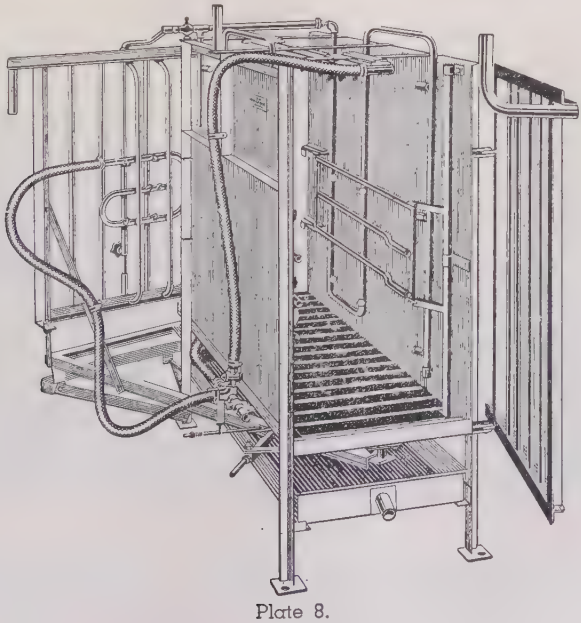


Plate 8.

A Modern Type of Multi-spray Race.

Grazier Builds Receiving Tanks to Last a Lifetime

By Officers of the Sheep and Wool Branch.

There is a drought lesson to be learnt from the initiative of a far-western grazier who waters his stock from six concrete tanks. Through the long dry spell sub-artesian water from these tanks ran into 21 concrete troughs to satisfy the thirst of 15,000 sheep.

A visit to Mr. R. L. Davidson's property, "Manfred," in the Longreach district, confirmed the results of this enterprising grazier's 15 years' experience in water conservation.

Mr. Davidson has a keen eye for improvements—and those he makes are there to last. That is how he came to experiment with concrete receiving tanks—he wanted tanks that would last a lifetime. Now he has them, and "Manfred" is recognised as being one of the best-watered properties in the State.

It has taken a number of years to evolve a technique that is both economical and efficient. Perhaps he may be able to improve further on the present method, but he feels that is doubtful. So he would be happy to see the system taken up and widely adopted throughout the grazing industry, having proved (by experience on neighbouring properties as well as his own) that it is a solution to the watering problems of the grazier using sub-bores.

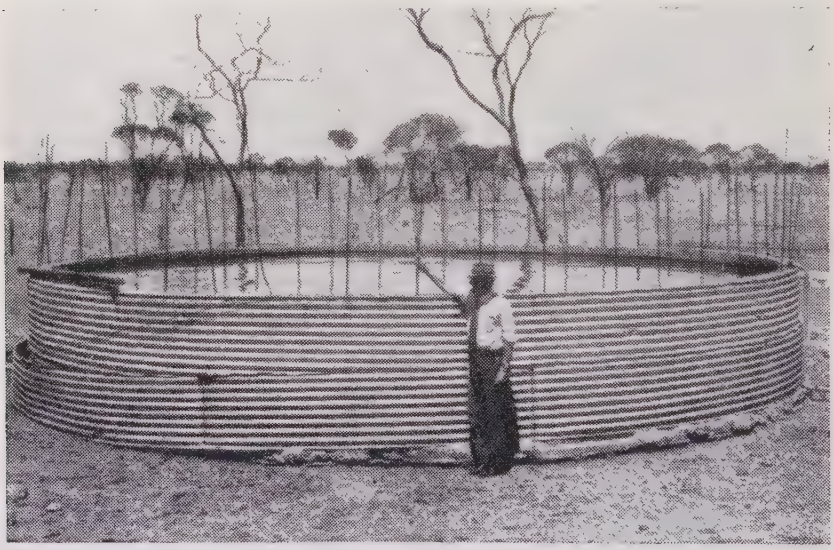


Plate 1.

A 15,000-Gallon Concrete Tank on "Manfred". Reinforcement rods are in place for extension upwards to increase capacity of tank.

Plate 2.
A 5,000-Gallon Concrete Tank 10 Years Old.

Plate 3.
An 18,000-Gallon Concrete Tank 12 Years Old.

5 ft. Tank Holds 19,000 Gal.

"Manfred" has six concrete tanks, ranging in size from 5,000 gallons up to 19,000 gallons. The largest has an internal diameter of 28 ft. and is 5 ft. in height. At the beginning, plaster was used to line leaking iron tanks, but this was unsatisfactory and now all tanks are of reinforced concrete.

It was found unnecessary to have a bottom in these tanks in black soil. They are quite water-tight, and there is not even a suspicion of seepage, so long as the wall is let two feet into the ground.

How to Construct.

Here is the construction procedure, as Mr. Davidson himself explained it.

"We dig a circular trench two feet deep around the required diameter, and place vertical half-inch rods, two feet apart, in the middle of the trench, pushing them a few inches into the ground so that they will stand up. We next commence tying on the horizontal reinforcement, consisting of half-inch rods spaced about six inches apart, round and round in a spiral to about three inches above the ground level. We fill the trench with concrete to three inches above ground level.

"Our sand is good but the gravel has not a great range of sizes, so we use a mixture of—1 cement, 2¼ sand and 2¼ gravel.

"Next we place the inside form in position; then tie on more horizontal reinforcements to, say, about 2 ft. 6 in. above ground level. Now we put the outside form in position.

"We use a fairly rigid inside form made of angle iron and 3 in x 1 in. hardwood faced with 6 ft. x 2 ft. 6in. sheets of plain iron. The outside form consists of 24-gauge corrugated galvanised iron sheets bolted together. Measure the circumference of the inside form and make the circumference of the outside form 3 ft. 2 in. larger for a six-inch wall. Cut some pieces of 2 in. x 1 in. into 5½ in. lengths and place them in between the forms to keep them in relative position. The minimum width of the wall then would be 5½ in.

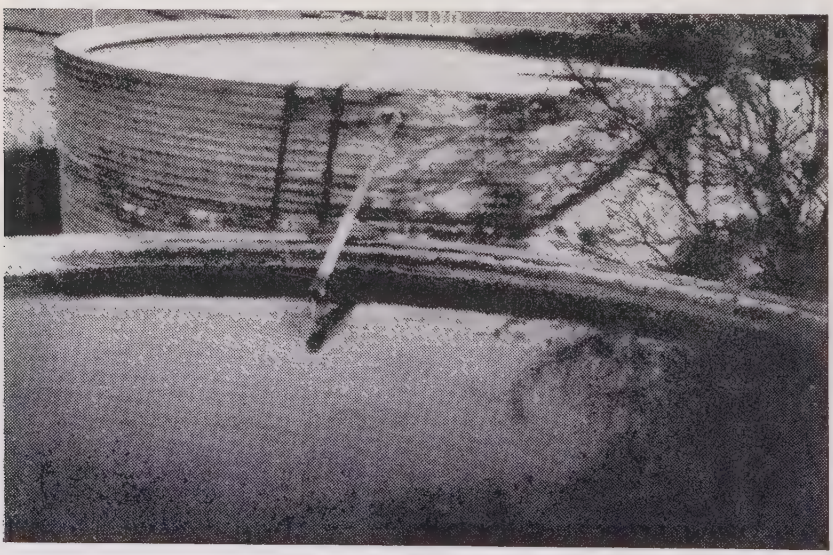


Plate 4.

Twin Concrete Tanks of 15,000 and 18,000 gallons.

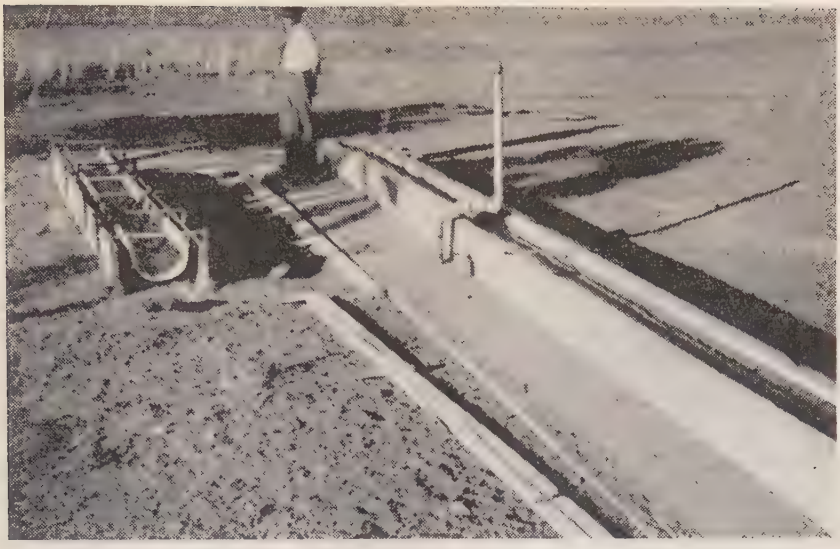


Plate 5.

Concrete Trough Under Construction. See forms on left, used in construction of trough. Mr. R. L. Davidson, owner of "Manfred", and designer of the tanks and troughs, is in the background.

Plate 6.

An Excellent Concrete Trough With Concrete Apron and Welded Piping Guard Rails. The apron prevents the ground from being hollowed out by thousands of hooves, and allows ewes and lambs to water easily.

Plate 7.
A Side View of the Trough Shown in Plate 6.

Plate 8.
A "Windmill View" of Concrete Tanks and Troughs at "Manfred".

"It is very important that the bottom forms be properly levelled before any concrete is poured, as any error here will be increased when you lift your forms for the next pouring.

Materials Required.

"The material required for a 15,000 gallon tank 22 ft. 6 in. in diameter and 6 ft. above ground, and foundation 2 ft. in ground, with no bottom and with wall 6 inches thick, is less than three tons of cement, about 12 cwt. of steel rods (mostly half inch, but three-eights can be used for the top section or all through if spaced more closely), about 360 four-gallon tins of sand and about 360 tins of small stones or gravel.

Labour and Time.

"The labour cost (very liberal) is about 36 man-days; that is, 12 days for three men, including gathering and carting sand and gravel.

"It will be realised that where no bottom is used the larger tanks are relatively cheaper as the cost increases with the diameter and the capacity increases with the square of the diameter."

Troughing.

Mr. Davidson favours trough watering. On "Manfred" 21 troughs water 15,000 sheep, and more troughs are in course of erection.

The concrete troughs are easy to keep clean but experiments are being made to find a way of extending the periods between cleaning. The wind at "Manfred" comes mostly from the south-east and north-east, and Mr. Davidson holds the view that if it is practicable to keep sheep off the eastern side the trough will not collect so much dust.

The important feature of concrete tanks and troughs in these times of high labour costs is that there is no maintenance to worry about.

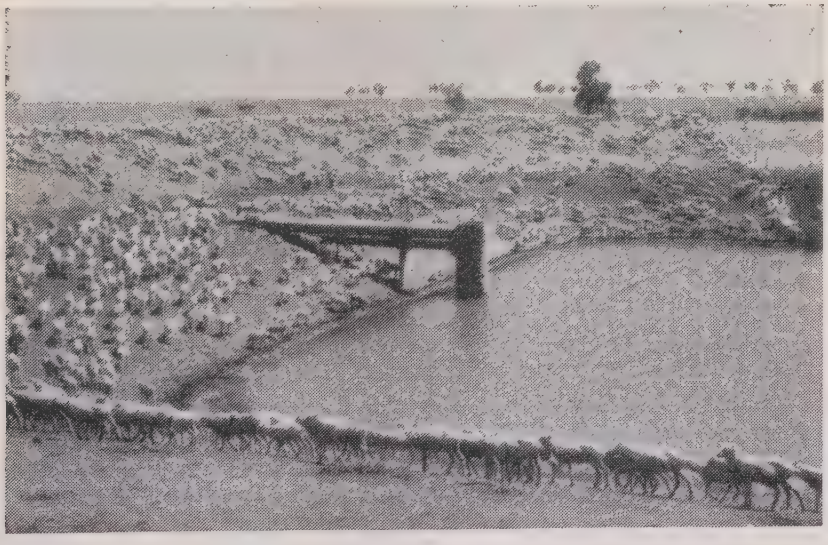


Plate 9.

Another Example of Concrete Work on "Manfred". The sturdy fluming that carries water into one of the excavated earth tanks. All the earth tanks are equipped in this manner, making "lifetime" concrete jobs that eliminate bank erosion during the filling of tanks.

Queensland Fauna Sanctuaries

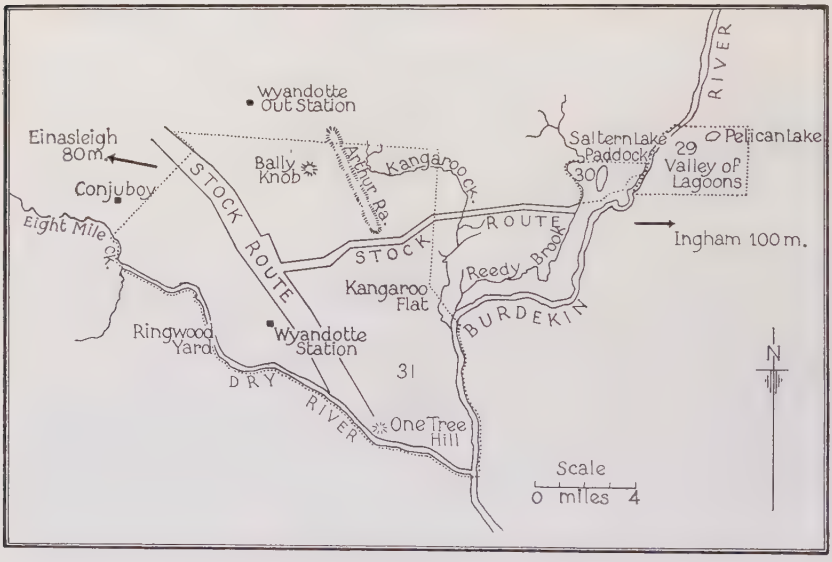
By C. ROFF, Fauna Officer.

(*Continued from page* 41, *January*, 1958.)

The following is an index of the sanctuaries outlined in Map 4.

SANCTUARY INDEX.

Index No.	Sanctuary.	Area in Acres.
29	Valley of Lagoons, Burdekin River	7,060
30	Saltern Lake Paddock, Reedy Brook Holding	2,460
31	Wyandotte Station, via Einasleigh	85,760



Map 4.

Map Showing Sanctuaries in Part of Fauna District No. 3. The Sanctuary boundaries are delineated by dotted lines.

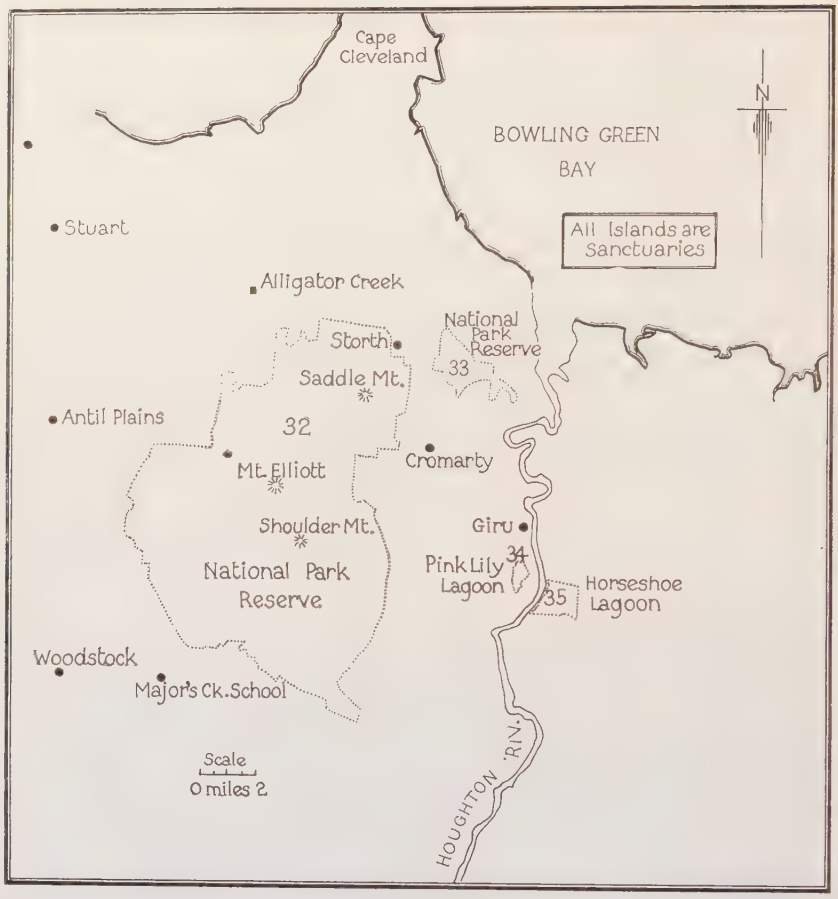
The following is an index of the sanctuaries outlined in Map 5.

SANCTUARY INDEX.

Index No.	Sanctuary.	Area in Acres.
32	National Park Reserve 253, Mount Elliott	60,000
33	National Park Reserve 418, Mount Burrumbush	2,360
34	Pink Lily Lagoon, Giru	224
35	Horseshoe Lagoon, R. 269, Giru	1,100

Plate 4.

Black Duck (Anas superciliosa Gmelin) in Flight. Waterfowl sanctuaries provide refuge for this species.



Map 5.

Map Showing Sanctuaries in Part of Fauna District No. 3. The Sanctuary boundaries are delineated by dotted lines.

[TO BE CONTINUED.]

INQUIRY ON SORGHUM ALMUM.

K.P., from Mackay district, has sent in an inquiry about *Sorghum almum*.

Answer: This species of sorghum is a prohibited plant in Queensland. It is also known as perennial sorghum or Columbus grass and is a hardy species of the Sudan or Johnson grass type. To date it is not sufficiently pure to warrant cultivation. Johnson grass is a well known pest and there is a fair chance of the seed harvested from *Sorghum almum* being contaminated with Johnson grass seed.

List of Fertilizers Registered Under "The Agricultural Standards Act of 1952."

Compiled by Registration Officers of the Standards Branch, Division of Marketing.

(*Continued from page 62, January, 1958.*)

MIXED FERTILIZERS– *continued.*

Grade Formula.	Name of Preparation.	Guaranteed Analysis.											Queensland Primary Dealer.
		Percentage Nitrogen (N) as			Percentage Phosphoric Acid (P_2O_5) as			Percentage Potash (K_2O) as		Percentage Miscellaneous.	Percentage Fine.	Percentage Coarse.	
		Nitrate of Soda.	Sulphate of Ammonia.	Blood, Bone & Offal.	Water Sol. Super.	Insol. Super.	Bone.	Sulphate.	Chloride.				
2·0–14·0–10·0 ..	FDL Tobacco No. 2 K ..	2·0	..	..	13·0	1·0	..	10·0	..	0·5 magnesia (MgO) as magnesium carbonate	..	..	Fertiliser Distributers Pty. Ltd.
2·0–15·25–8·0 ..	ACF Tobacco No. 11 ..	2·0	..	..	14·25	1·0	..	8·0	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
2·0–16·0–6·0 ..	FDL Tobacco No. 2 ..	2·0	..	..	15·0	1·0	..	6·0	..	..	..	..	Fertiliser Distributers Pty. Ltd.
	FDL Tobacco No. 2 North	2·0	..	..	15·0	1·0	..	6·0	..	..	..	..	ditto
2·0–16·25–6·0 ..	ACF Tobacco No. 12 ..	2·0	..	..	15·25	1·0	..	6·0	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
2·0–17·0–4·0 ..	ACF Tobacco No 1 ..	2·0	..	..	16·0	1·0	..	4·0	..	..	..	..	ditto
2·0–18·5–0 ..	GF Nitro-Super ..	..	2·0	..	18·5	..	..	..	..		..	..	General Fertilisers Ltd.
3·75–15·25–5·0 ..	ACF B 1 Planting (Gam. 50)	..	2·75	1·0	11·25	0·75	3·25	..	5·0	0·06 gamma isomer of benzene hexachloride	85	15	A.C.F. & Shirleys Fertilizers Ltd.
	ACF B 1 Planting (Gam. 75)	..	2·75	1·0	11·25	0·75	3·25	..	5·0	0·08 gamma isomer of benzene hexachloride	85	15	ditto
3·75–15·5–5·0 ..	ACF B 1 Planting ..	..	2·75	1·0	11·5	0·75	3·25	..	5·0	..	85	15	ditto
3·75–15·75–5·0 ..	ACF B 1 Q Planting (Gam. 50)	..	3·75	..	14·75	1·0	..	..	5·0	0·06 gamma isomer of benzene hexachloride	..	..	ditto
	ACF B 1 Q Planting (Gam. 75)	..	3·75	..	14·75	1·0	..	..	5·0	0·08 gamma isomer of benzene hexachloride	..	..	ditto
3·75–16·0–5·0 ..	ACF B 1 Q Planting ..	..	3·75	..	15·0	1·0	..	..	5·0	..	..	..	ditto
4·0–11·0–6·0 ..	FDL Tobacco No. 1 ..	4·0	..	..	10·25	0·75	..	6·0	..	2·0 magnesia (MgO) as magnesium carbonate	..	..	Fertiliser Distributers Pty. Ltd.
	FDL Tobacco No. 1 North	4·0	..	..	10·25	0·75	..	6·0	..	5·0 lime (CaO) as calcium carbonate	..	..	ditto
4·0–11·0–10·0 ..	FDL Tobacco No. 1 K ..	4·0	..	..	10·25	0·75	..	10·0	..	0·5 magnesia (MgO) as magnesium carbonate	..	..	ditto

MIXED FERTILIZERS—*continued.*

Grade Formula.	Name of Preparation.	Guaranteed Analysis.											Queensland Primary Dealer.
		Percentage Nitrogen (N) as			Percentage Phosphoric Acid (P_2O_5) as			Percentage Potash (K_2O) as		Percentage Miscellaneous.	Percentage Fine.	Percentage Coarse.	
		Nitrate of Soda.	Sulphate of Ammonia.	Blood, Bone & Offal.	Water Sol. Super.	Insol. Super.	Bone.	Sulphate.	Chloride.				
4·0–11·5–12·0 ..	ACF No. 4 (Borax 112)	..	3·0	1·0	7·75	0·5	3·25	..	12·0	0·55 boron (B) as borax	90	10	A.C.F. & Shirleys Fertilizers Ltd.
4·0–11·5–12·5 ..	FDL Sugar Bureau No. 2 Ratoon	..	3·25	0·75	8·0	0·5	3·0	..	12·5	0·5 magnesia (MgO) as magnesium carbonate	85	15	Fertiliser Distributers Pty. Ltd.
4·0–12·0–15·0 ..	GF 2	..	2·0	2·0	3·0	..	9·0	..	15·0	1·0 magnesia (MgO) as magnesium carbonate	90	10	General Fertilisers Ltd.
	GF 6 BHC	..	2·0	2·0	3·0	..	9·0	..	15·0	0·06 gamma isomer of benzene hexachloride	90	10	ditto
4·0–12·25–8·0 ..	ACF Tobacco No. 10 ..	4·0	..	..	11·5	0·75	..	8·0	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
4·0–12·5–12·0 ..	ACF No. 4	..	3·0	1·0	8·75	0·5	3·25	..	12·0	..	90	10	ditto
	FDL Direction No. 1 X	..	3·25	0·75	8·25	0·5	3·75	..	12·0	0·4 magnesia (MgO) as magnesium carbonate	85	15	Fertiliser Distributers Pty. Ltd.
	FDL Direction No. 1 X with Ferro F.T.E.	..	3·25	0·75	8·25	0·5	3·75	..	12·0	0·175 iron (Fe) 0·063 manganese (Mn) 0·080 zinc (Zn) 0·015 boron (B) 0·080 copper (Cu) 0·003 molybdenum (Mo) } as complex silicates	85	15	ditto
4·0–13·0–3·0 ..	GF 7	..	2·0	2·0	4·0	..	9·0	..	3·0	1·0 magnesia (MgO) as magnesium carbonate	90	10	General Fertilisers Ltd.
4·0–13·0–6·0 ..	ACF Tobacco No. 2 ..	4·0	..	..	12·5	0·5	..	6·0	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
	FDL Direction No. 1 ..	..	3·25	0·75	9·5	0·5	3·0	..	6·0	1·0 magnesia (MgO) as magnesium carbonate	85	15	Fertiliser Distributers Pty. Ltd.

* Denotes nitrogen (N) derived from bone.

4·0–14·0–6·0 ..	FDL Sugar Bureau No. 1 Ratoon North	..	3·5	*0·5	9·0	0·5	4·5	..	6·0	4·0	lime (CaO) as calcium carbonate	85	15	ditto
	GF 4	..	2·0	2·0	5·0	..	9·0	..	6·0	1·0	magnesia (MgO) as magnesium carbonate	90	10	General Fertilisers Ltd.
	GF 12 BHC	..	2·0	2·0	5·0	..	9·0	..	6·0	1·0	magnesia (MgO) as magnesium carbonate	90	10	ditto
										0·08	gamma isomer of benzene hexachloride			
	GF 15 BHC	..	2·0	2·0	5·0	..	9·0	..	6·0	1·0	magnesia (MgO) as magnesium carbonate	90	10	ditto
										0·06	gamma isomer of benzene hexachloride			
4·0–14·25–6·0 ..	FDL Sugar Bureau No. 1 Ratoon	..	3·25	*0·75	10·5	0·75	3·0	..	6·0	0·4	magnesia (MgO) as magnesium carbonate	85	15	Fertiliser Distributers Pty. Ltd.
4·0–15·0–2·0 ..	FDL No. 11 North ..	..	3·0	1·0	9·5	0·5	5·0	..	2·0	4·0	lime (CaO) as calcium carbonate	80	20	ditto
4·0–16·75–2·0 ..	FDL No. 11	..	3·5	*0·5	11·5	0·75	4·5	..	2·0	0·4	magnesia (MgO) as magnesium carbonate	85	15	ditto
4·0–17·0–0 ..	Shirleys No. 8	..	4·0	..	16·25	0·75	..	..	..		..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
4·25–11·0–12·5 ..	FDL Sugar Bureau No. 2 Ratoon North	..	3·5	0·75	6·75	0·5	3·75	..	12·5	3·6	lime (CaO) as calcium carbonate	85	15	Fertiliser Distributers Pty. Ltd.
	WM Bureau No. 2 North	..	3·5	0·75	6·75	0·5	3·75	..	12·5	3·6	lime (CaO) as calcium carbonate	80	20	Walter Milne
4·25–12·0–12·5 ..	ACF K 18 X (Sugar Bureau No. 2 Ratooning)	..	3·25	1·0	8·25	0·5	3·25	..	12·5		..	85	15	A.C.F. & Shirleys Fertilizers Ltd.
4·25–12·5–12·5 ..	ACF K 18 (Sugar Bureau No. 2 Ratooning)	..	4·25	..	11·75	0·75	..	..	12·5		..	..	..	ditto
4·25–14·5–6·25 ..	ACF K 17 X (Sugar Bureau No. 1 Ratooning)	..	3·25	1·0	10·5	0·75	3·25	..	6·25		..	85	15	ditto
4·25–14·75–6·25	ACF K 17 (Sugar Bureau No. 1 Ratooning)	..	4·25	..	14·0	0·75	..	..	6·25		..	..	..	ditto
4·5–6·0–22·5 ..	FDL Sugar Bureau No. 3 Ratoon North	..	3·75	0·75	2·25	..	3·75	..	22·5	4·8	lime (CaO) as calcium carbonate	85	15	Fertiliser Distributers Pty. Ltd.
	WM Bureau No 3 North	..	3·75	0·75	2·25	..	3·75	..	22·5	4·8	lime (CaO) as calcium carbonate	85	15	Walter Milne
4·5–6·25–22·5 ..	FDL Sugar Bureau No. 3 Ratoon	..	3·75	0·75	3·0	0·25	3·0	..	22·5	1·2	magnesia (MgO) as magnesium carbonate	85	15	Fertiliser Distributers Pty. Ltd.
4·5–8·0–22·5 ..	ACF K 19 X (Sugar Bureau No. 3 Ratooning)	..	3·5	1·0	4·5	0·25	3·25	..	22·5		..	85	15	A.C.F. & Shirleys Fertilizers Ltd.
4·5–8·5–22·5 ..	ACF K 19 (Sugar Bureau No. 3 Ratooning)	..	4·5	..	8·0	0·5	..	..	22·5		..	..	..	ditto

* Denotes nitrogen (N) derived from bone.

MIXED FERTILIZERS—*continued.*

Grade Formula.	Name of Preparation.	Guaranteed Analysis.											Queensland Primary Dealer.
		Percentage Nitrogen (N) as			Percentage Phosphoric Acid (P_2O_5) as			Percentage Potash (K_2O) as		Percentage Miscellaneous.	Percentage Fine.	Percentage Coarse.	
		Nitrate of Soda.	Sulphate of Ammonia.	Blood, Bone & Offal.	Water Sol. Super.	Insol. Super.	Bone.	Sulphate.	Chloride.				
4·5–12·0–6·0 ..	FDL Direction No. 5 N ..	..	4·5	..	12·0	..	..	..	6·0	3·0 lime (CaO) as calcium carbonate	..	..	Fertiliser Distributers Pty. Ltd.
4·5–13·0–6·0 ..	FDL Direction No. 5 ..	..	4·5	..	12·25	0·75	..	..	6·0	1·0 magnesia (MgO) as magnesium carbonate	..	..	ditto
4·5–15·5–2·5 ..	ACF Bean Mixture ..	..	4·5	..	15·0	0·5	..	..	2·5	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
4·5–16·0–0 ..	FDL No. 10	..	4·5	..	15·0	1·0	..	..	..	0·4 magnesia (MgO) as magnesium carbonate	..	..	Fertiliser Distributers Pty. Ltd.
5·0–8·5–23·0 ..	GF 2B	..	3·0	2·0	..	..	8·5	..	23·0	0·5 magnesia (MgO) as magnesium carbonate	90	10	General Fertilisers Ltd.
5·0–9·25–15·0 ..	FDL Volcanic North ..	..	4·25	0·75	5·25	0·25	3·75	..	15·0	3·6 lime (CaO) as calcium carbonate	85	15	Fertiliser Distributers Pty. Ltd.
5·0–9·5–15·0 ..	FDL Volcanic	..	4·25	0·75	6·0	0·5	3·0	..	15·0	0·6 magnesia (MgO) as magnesium carbonate	85	15	ditto
5·0–9·5–17·5 ..	ACF No. 12 Special ..	..	5·0	..	9·0	0·5	..	..	17·5	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
5·0–10·75–15·0..	FDL Volcanic BHC North	..	4·25	0·75	6·75	0·25	3·75	..	15·0	0·05 gamma isomer of benzene hexachloride	85	15	Fertiliser Distributers Pty. Ltd.
5·0–11·0–8·0 ..	GF 3	..	3·0	2·0	2·0	..	9·0	..	8·0	1·0 magnesia (MgO) as magnesium carbonate	90	10	General Fertilisers Ltd.
5·0–13·0–2·5 ..	GF 1	..	3·0	2·0	4·0	..	9·0	..	2·5	1·0 magnesia (MgO) as magnesium carbonate	90	10	ditto
5·0–13·0–5·0 ..	Home Garden Fertilizer No. 4 Fish	..	3·5	1·5	7·0	..	6·0	..	5·0	0·7 magnesia (MgO) as magnesium carbonate	80	20	Beckey Florists
	Cochranes No. 4 Fish ..	..	3·65	1·35	7·0	..	6·0	..	5·0	1·1 magnesia (MgO) as magnesium carbonate	80	20	D. Cochrane

5·0–13·25–5·0 ..	ACF No. 1 (Borax) 60 ..	..	3·5	1·5	7·75	0·5	5·0	..	5·0	0·3 boron (B) as borax	85	15	A.C.F. & Shirleys Fertilizers Ltd.
5·0–13·5–2·0 ..	FDL Direction Bean Special	..	5·0	..	12·75	0·75	..	..	2·0	1·4 magnesia (MgO) as magnesium carbonate	..	..	Fertiliser Distributers Pty. Ltd.
	FDL Legume Special ..	..	5·0	..	12·75	0·75	..	..	2·0	1·4 magnesia (MgO) as magnesium carbonate	..	..	ditto
	FDL Legume Special with Ferro F.T.E.	..	5·0	..	12·75	0·75	..	..	2·0	1·1 magnesia (MgO) as magnesium carbonate	..	..	ditto
										0·175 iron (Fe) 0·063 manganese (Mn) 0·080 copper (Cu) 0·080 zinc (Zn) 0·015 boron (B) 0·003 molybdenum (Mo)	as compl silicates	ex	
5·0–13·5–5·0 ..	Grow-Betta Garden Fertilizer for General Purposes	..	3·5	1·5	8·5	..	5·0	..	5·0	..	85	15	Bill Cordiner
	FDL No. 4 Fish	..	4·0	1·0	8·5	0·5	4·5	..	5·0	0·6 magnesia (MgO) as magnesium carbonate	80	20	Fertiliser Distributers Pty. Ltd.
	FDL No. 4 Fish North ..	..	4·0	1·0	7·5	0·5	5·5	..	5·0	2·8 lime (CaO) as calcium carbonate	80	20	ditto
	FDL No. 4 Fish Borax–42	..	4·0	1·0	8·5	0·5	4·5	..	5·0	0·2 magnesia (MgO) as magnesium carbonate	80	20	ditto
	FDL No. 4 Fish Borax 70	..	4·0	1·0	8·5	0·5	4·5	..	5·0	0·2 boron (B) as borax 0·1 magnesia (MgO) as magnesium carbonate	80	20	ditto
	FDL No. 4 Fish with Ferro F.T.E.	..	4·0	1·0	8·5	0·5	4·5	..	5·0	0·3 boron (B) as borax 0·2 magnesia (MgO) as magnesium carbonate	80	20	ditto
										0·175 iron (Fe) 0·063 manganese (Mn) 0·080 copper (Cu) 0·080 zinc (Zn) 0·015 boron (B) 0·003 molybdenum (Mo)	as compl silicates	ex	
	FDL Direction No. 3 ..	..	4·0	1·0	8·5	0·5	4·5	..	5·0	0·6 magnesia (MgO) as magnesium carbonate	80	20	ditto
	WM 4 North	..	4·0	1·0	7·5	0·5	5·5	..	5·0	2·8 lime (CaO) as calcium carbonate	80	20	Walter Milne
5·0–14·0–5·0 ..	ACF No. 1	..	3·5	1·5	8·5	0·5	5·0	..	5·0	..	85	15	A.C.F. & Shirleys Fertilizers Ltd.
	ACF Nu-Life Garden Fertilizer	..	3·5	1·5	8·5	0·5	5·0	..	5·0	..	85	15	ditto

MIXED FERTILIZERS—*continued.*

Grade Formula.	Name of Preparation.	Guaranteed Analysis.											
		Percentage Nitrogen (N) as			Percentage Phosphoric Acid (P_2O_5) as			Percentage Potash (K_2O) as		Percentage Miscellaneous.	Percentage Fine.	Percentage Coarse.	Queensland Primary Dealer.
		Nitrate of Soda.	Sulphate of Ammonia.	Blood, Bone & Offal.	Water Sol. Super.	Insol. Super.	Bone.	Sulphate.	Chloride.				
	Shirleys Q5 (Muriate) ..	..	5·0	..	13·5	0·5	..	..	5·0	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
	Lamberts Fertilizer (No. 1 Mixture)	..	3·5	1·5	8·5	0·5	5·0	..	5·0	..	85	15	Lamberts Pty. Ltd.
	Lane's Complete Garden Fertiliser	..	3·5	1·5	8·5	0·5	5·0	..	5·0	..	85	15	Lane's Pty. Limited
	Lane's No. 5 Garden Fertiliser	..	5·0	..	13·5	0·5	..	..	5·0	..	..	..	ditto
	Richards Q5 (Muriate) ..	..	5·0	..	13·5	0·5	..	..	5·0	..	..	..	H. J. Richards & Sons
5·0–14·25–5·0 ..	FDL No. 4 Fish BHC North	..	3·75	1·25	8·25	0·5	5·5	..	5·0	0·05 gamma isomer of benzene hexa-chloride	80	20	Fertiliser Distributers Pty Ltd.
	FDL No. 4 Fish BHC South	..	3·75	1·25	8·25	0·5	5·5	..	5·0	0·08 gamma isomer of benzene hexa-chloride	80	20	ditto
5·0–14·5–5·0 ..	FDL No. 4 Fish BHC N	..	4·0	1·0	8·5	0·5	5·5	..	5·0	0·05 gamma isomer of benzene hexa-chloride	80	20	ditto
	WM 4 BHC North ..	..	4·0	1·0	8·5	0·5	5·5	..	5·0	0·05 gamma isomer of benzene hexa-chloride	80	20	Walter Milne
5·5–12·25–5·0 ..	ACF Rose Fertilizer ..	..	3·0	2·5	4·25	..	8·0	5·0	..	..	75	25	A.C.F. & Shirleys Fertilizers Ltd.
	Richards Rose Fertilizer	..	3·0	2·5	4·25	..	8·0	5·0	..	..	75	25	H. J. Richards & Sons
5·5–13·5–5·0 ..	Webster's No. 1 Fertiliser	..	4·25	1·25	8·75	0·5	4·25	..	5·0	..	85	15	H. A. Webster Pty. Ltd.
6·0–11·0–10·0 ..	GF 16 Banana	..	4·0	2·0	2·5	..	8·5	..	10·0	1·0 magnesia (MgO) as magnesium carbonate	90	10	General Fertilisers Ltd.
6·75–14·25–0 ..	Shirleys No. 9	..	6·75	..	13·75	0·5	..	..	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
7·0–10·0–10·0 ..	ACF B 3	..	6·0	1·0	6·5	0·25	3·25	..	10·0	..	90	10	ditto
	ACF B 3 Q	..	7·0	..	9·5	0·5	..	..	10·0	..	..	..	ditto
	ACF B 3 Q (Gam. 50) ..	..	7·0	..	9·5	0·5	..	..	10·0	0·06 gamma isomer of benzene hexa-chloride	..	..	ditto
	Shirleys Big 3	..	7·0	..	9·5	0·5	..	..	10·0	..	..	..	ditto

[TO BE CONTINUED.]

Plate 1.

Mr. H. G. Osborne, Chief Lecturer in Clinical Medicine, Examining a Dead Sheep.

Careers For Country Boys And Girls

No. 1—Veterinary Science

By E. T. HOCKINGS, Editor of Publications.

There is, in Queensland particularly, a strong demand for young men and women trained in plant and animal science. Some qualified observers feel that the shortage of veterinarians is the most acute and the most likely to continue.

Australia is a country that owes its prosperity very largely to its primary industries. This is a simple fact that is often overlooked by many in the community. Too few of the teeming crowds in our large coastal cities have any conscience in the matter—which is probably why agriculture has long been an unfavoured profession.

But the vital link between our welfare and our agriculture has begun at last to register on the mind of the public. People are now opening their eyes to the tremendous development that this continent is capable of; the riches that are within our reach.

The enlightened recognise that our destiny will be fulfilled only when our farmers and our scientists are working

shoulder to shoulder to overcome the special problems of primary production.

It is heartening to note the call issuing throughout the nation for recruits in the branches of science that contribute towards the development of rural industry.

As Sir Ian Clunies Ross said, in the John Murtagh Macrossan Memorial Lectures on J. H. Gilruth, "In the terms of the results achieved in the past and the possibilities that lie ahead, there are still in Australia, and not least in Queensland, too few workers in the field of plant and animal science, steady though the improvement has been in recent years. Here is a fascinating and challenging field for the brightest young scientists that the country can produce; the challenge of a hard and difficult continent which it is in their hands to subdue; the prospect that they can make a contribution to the well-being of the Commonwealth greater by far for decades to come than can be expected from nuclear physics, glamorous though that field of endeavour may be."

It may be that many boys and girls from country areas, with their background of rural living, will wish to be in the vanguard of those answering the call. Certainly, if they feel an urge to combine the making of an interesting and a profitable living with truly worthwhile service to mankind, then there are rewarding paths for them to tread among the network of roads that leads through scientific training to better farming.

In our own State of Queensland there are accepted ways in which youth may qualify to carry the advances of science to the rural community. They are through primary and secondary education to the Faculties of (1) Science (degrees in Science and Applied Science), (2) Veterinary Science, or (3) Agriculture (degree of Bachelor of Agricultural Science) at the University and (4) through courses at the Agricultural College, Lawes.

Dealing first with the course of training in veterinary science, it should encourage young people to know that, while the total cost of the course in fees is about £500, or £100 a year, Commonwealth scholarships and State cadetships, which pay fees and living allowances, are available from the Department of Agriculture and Stock, and other sources.

THE WORK.

Quoting from a circular issued by the Dean of the Faculty of Veterinary Science at the University of Queensland, "The Veterinary student has to study the structure and function of various domestic animals, and the best methods of breeding, feeding and rearing them, which in turn involves a general knowledge of botany and agricultural practice.

"He studies the bacteria, viruses and parasites which cause the major infectious diseases, and how to prevent these diseases.

"In clinical medicine he learns how to treat individual sick animals, and how to use surgical and obstetrical techniques.

"Fortunately the most damaging infectious diseases do not occur in Australia, and it is one of the veterinarian's tasks to see that they continue to be excluded.

"In addition, the veterinary profession is concerned with increasing the efficiency of livestock production; with the fitness of meat, milk and other animal products for human consumption, thus protecting the community from diseases of animal origin.

"And last but not least important, the prevention and alleviation of suffering in farm and pet animals.

THE TRAINING.

"Any young man or woman who has satisfied the matriculation requirements may enter the Faculty of Veterinary Science with good prospects of completing the course satisfactorily. A rural background, while an advantage, is not essential. The main subjects of study in the course are:—*

First Year—Chemistry, Physics, Botany, Zoology, and Animal Husbandry.

Second and Third Years—Anatomy, Physiology and Biochemistry, Animal Husbandry, Nutrition and Genetics, Pathology and Parasitology.

Fourth and Fifth Years—Bacteriology, Medicine, Surgery, Animal Husbandry, Agrostology, Meat Inspection and Jurisprudence.

"Students graduate as Bachelors of Veterinary Science and may subsequently work towards the higher degrees of Master of Veterinary Science, Doctor of Philosophy and Doctor of Veterinary Science.

*Full details available in the Faculty Handbook, which is obtainable from the Registrar.

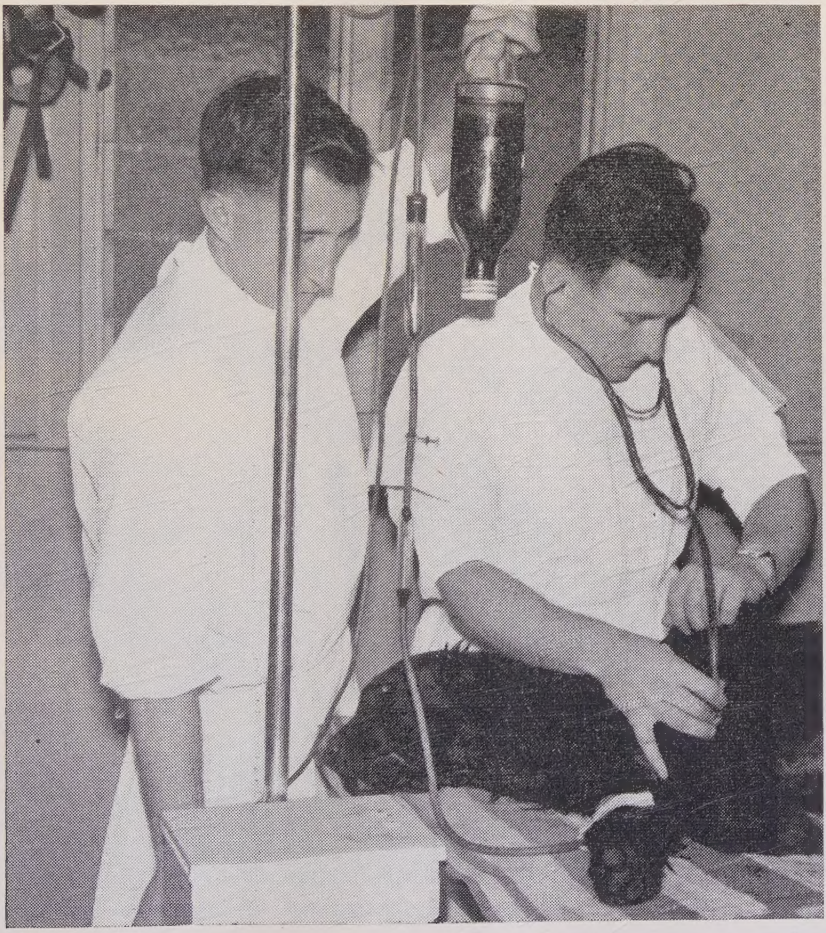


Plate 2.

Students Administering Blood Transfusion to a Dog which has just Undergone an Operation.—"Courier-Mail" photo.

"Graduates must have a sound practical as well as theoretical training. Clinical experience is obtained at the daily clinic which is held at the Veterinary School where owners present their animals for examination and treatment, and attached to which there are hospital blocks for large and small animals.

"In addition, final year students make extensive trips in a specially equipped station wagon to assist members of the clinical staff perform work on sheep and cattle properties. They thus become familiar with the methods of animal management practised in the State, and are shown how to apply theoretical teaching in this subject as well as in clinical medicine.

"Trips of about 10 days' duration are being made regularly to more distant grazing areas. Usually three students are taken on each trip, which may cover 1,500 miles, and this alone helps to familiarise final year students with the grazing areas of Queensland.

"Work is usually done on 10 to 12 properties and is conducted in exactly the same way as it would be by a practising veterinarian.

"In this way students work under conditions they will have to meet after

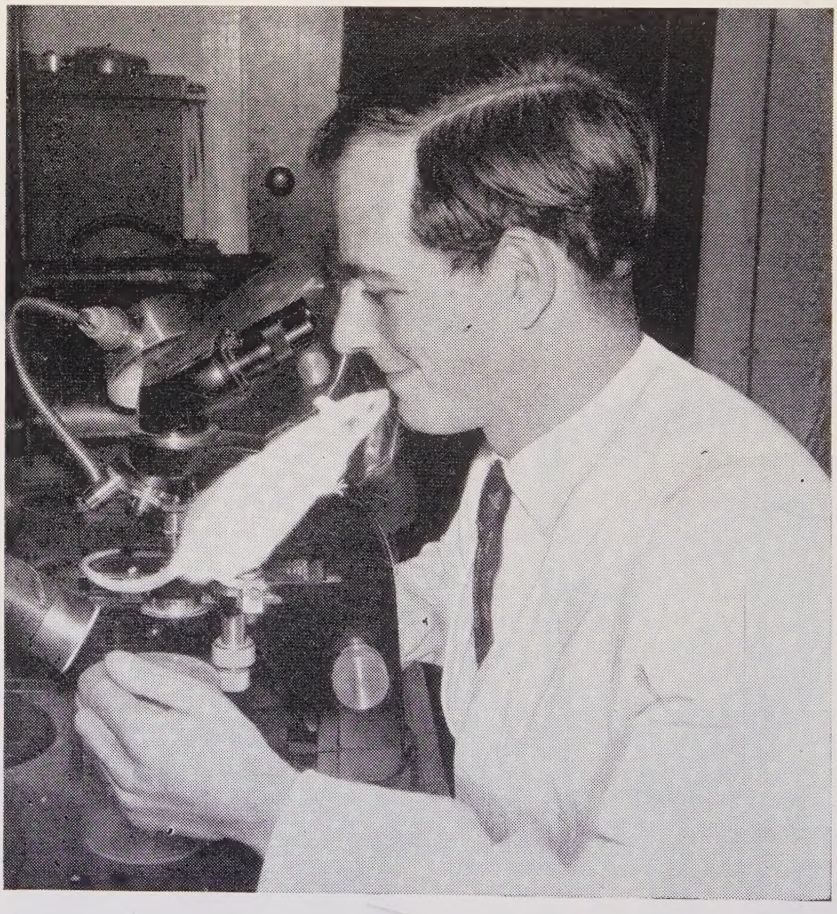


Plate 3.

A Research Fellow About to Begin Some Laboratory Work (Under the Close Surveillance of a Tame Mouse!).

[*"Courier-Mail" photo.*

qualifying, which cannot possibly be duplicated within the precincts of the School. This experience obviously does much to enhance the ability of students to undertake field work as Departmental Officers after qualifying. In addition, graziers in more distant parts of the State become familiar with the service that can be rendered by veterinarians, both in the disease and husbandry fields.

"Groups of senior students work in the Pathology and Bacteriology Laboratories, and also in the Animal Research Institute of the Department of Agriculture and Stock. On the University Farm, students handle various classes of stock, study methods of management, feeding, breeding and disease control, and undertake certain project work in the senior years.

THE SERVICE.

"In the Government Veterinary Service there is greater emphasis on prevention and control of disease in the herd or flock, and prevention and eradication of animal plagues. Government veterinarians carry out research and extension work associated with disease control, animal nutrition and breeding of cattle, sheep, pigs and poultry.

"Full-time research work in the laboratory or in the field is carried out by the Department of Agriculture and Stock and other organisations. It is combined with teaching in the veterinary and agricultural schools at the University. In all these organisations work can be divided broadly into the two fields of disease control and animal husbandry research, although there is much overlap between the two."

THE SALARY.

The circular gives an outline of present salary levels for veterinarians, showing that the Queensland Government veterinary and animal husbandry services offer a starting salary of £1,232 to new graduates, with steady progression to £1,692 and opportunities for advancement beyond this through Divisional Veterinary Officer or Senior Husbandry Officer (max. £1,837) to head of a Branch.

It is generally conceded that there is a good demand for graduates and that this is likely to continue.

[TO BE CONTINUED.]

QUESTION ON STORING POTATO TUBERS.

J.B., of Killarney, has inquired about methods of storing potato tubers harvested in May-June for planting in the following January. He inquires too about the detection of Irish Blight in the tubers.

Answer: Seed potatoes have been successfully held in cold storage for lengthy periods. It is essential to maintain a constant temperature of 45 deg. F. and to spread the tubers out on storage racks which permit good ventilation.

As a general rule Queensland potato growers select their seed potatoes for summer or autumn plantings from the spring crop lifted during the October-November period.

Should any of the tubers being stored show any signs of disease, or be suspected of being diseased, separate them from the whole and forward a sample to the Agriculture Department for investigation and report.

Further information on potato storage will be found in the Departmental leaflets on the subject and these may be obtained on request.

Brucellosis-Tested Swine Herds (As at 1st January, 1958).

Berkshire.

A. P. and N. Beatty, "Deepdene," Barambah road, Nanango
S. Cochrane, "Stanroy" Stud, Felton
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
J. H. N. Stoodley, "Stoodville," Ormiston
H.M. State Farm, Numinbah
G. L. Gabanko and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
C. E. Edwards, "Spring Valley" Stud, Kingaroy
W. Young, Kybong, via Gympie
H. H. Sellars, "Allambie" Stud, Tabooba, Beaudesert
E. J. Clarke, Mt. Alford, *via* Boonah
G. McLennan, "Murcott" Stud, Willowvale
C. F. W. and B. A. Shellback, "Redvilla" Stud, Kingaroy
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
E. R. Kimber, Block 11, Mundubbera
A. J. Potter, "Woodlands," Inglewood
Regional Experiment Station, Hermitage
J. W. Bukowski, "Secreto" Stud, Oxley
R. Astbury, "Rangvilla," Pechey
L. Pick, Mulgildie
D. G. Grayson, Killarney
A. French, "Wilson Park," Pittsworth
P. L. and M. T. D. Hansen, "Regal" Stud, Oaklands, Rangeville, Toowoomba
D. Ludwig, Cainable, via Beaudesert.

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood.
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood.
H. R. Gibson, "Thistleton" Stud, Maleny
H.M. State Farm, Numinbah
V. P. McGoldrick, "Fairymeadow" Stud, Cooroy
S. T. Fowler, "Kenstan" Stud, Pittsworth
W. Zahnow, Rosevale, *via* Rosewood
Regional Experiment Station, Biloela
G. J. Hutton, "Grajea" Stud, Cabarlah
H. L. Larsen, "Oakway," Kingaroy
A. Palmer, "Remlap," Greenmount
G. I. Skyring, "Bellwood" Stud, *via* Pomona
G. Pampling, Watch Box road, Goomeri
M. Hall, "Milena" Stud, D'Aguilar
K. B. Jones, "Cefn" Stud, Pilton road, Clifton
O. B. Vidler, Manneum, Kingaroy
K. F. Stumer, French's Creek, Boonah
Q.A.H.S. and College, Lawes
R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri
L. Stewart, Mulgowie, *via* Laidley
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy
B. F. Jensen, Rosevale
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes, Brisbane
R. Kennard, Collar Stud, Warwick
A. C. H. Gibbons, Mt. Glorious
A. Kanowski, "Exton," Pechey
L. C. and E. Wieland, Lower Cressbrook
P. L. and M. T. D. Hansen, "Regal" Stud, Oaklands, Rangeville, Toowoomba.
P. F. Ives, Capalaba
D. Ludwig, Cainable, via Beaudesert

Tamworth.

D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
Department of Agriculture and Stock, Regional Experiment Station, Kairi
F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
H. J. Armstrong, "Alhambra," Crownthorpe, Murgon
R. H. Coller, Tallegalla, *via* Rosewood
D. V. and P. V. Campbell, "Lawn Hill," Lamington
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
L. C. and E. Wieland, Lower Cressbrook

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
C. R. Smith, "Belton Park" Stud, Nara
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale" Stud, 492 Beenleigh road, Sunnybank
Kruger and Sons, "Greyhurst," Goombungee
A. Scott, "Wanstead" Stud, Grantham
G. C. Burnett, "Rathburnie," Linville
R. A. Collings, "Rutholme" Stud, Waterford